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AN OUTBREAK OF PSITTACOSIS AT THE NATIONAL ZOOLOGICAL PARK, WASHINGTON, D. C.[1]

By T. H. TOMLINSON, JR., *Passed Assistant Surgeon, United States Public Health Service*

Last winter there occurred at the National Zoological Park, Washington, D. C., an outbreak of psittacosis. Because of the economic damage to the bird collection, the public health hazard, and the problem of adequate quarantine of imported birds, it is felt that a report of this outbreak would be of some interest and value.

In an effort to prevent the introduction of psittacosis into the bird house, certain quarantine procedures have been routinely practiced for a number of years. These preventive measures consisted of the isolation of all newly imported psittacine birds for a minimum of 3 weeks after arrival. Since 1937 all birds dying during this quarantine period have been submitted to the Division of Pathology, National Institute of Health, for examination for psittacosis. Up to the present time this procedure has not revealed any infected birds among the new acquisitions.

On January 21, 1941, two dead parrots were received from the principal keeper in charge of the bird house. These were not from the lot then in quarantine but were from the collection on exhibit in the parrot room. Two days later, before the diagnosis on these first two was conclusive, a third parrot was received. Simultaneously, the director of the park reported that one of the bird house employees was ill. On January 24, the findings in the first two parrots were so suggestive of psittacosis that the director closed the parrot room of the bird house. On the morning of January 25, a definite diagnosis of psittacosis was made on the first two birds and the entire bird house was closed to the public. On this same day a diagnosis of psittacosis was made on the sick attendant.

Faced with the definite appearance of this serious and contagious disease, the authorities of the park began to submit for examination to the National Institute of Health all birds found dead and also all those destroyed because of apparent illness. The following report is based upon the data obtained from the examination of the first 60

[1] From the Division of Pathology, National Institute of Health.

birds received, of which 51 died and 9 were killed. All birds dying in the enclosed bird house were submitted. In addition, for the first 2 weeks all dead birds from outdoor cages were examined.

Examination was carried out from a few hours to 2 days after death; in the latter case the bird was preserved for most of this time at 0° C. In most cases tissue emulsions were injected into mice at the time of autopsy, but occasionally the tissue was preserved in 50 percent neutral buffered glycerine for from 1 to 10 days before inoculation. In spite of the interval between death and fixation, the solid organs of most birds were well enough preserved to permit histopathological diagnosis, attention being mainly centered on the liver and kidney. Because of autolysis, the gastro-intestinal tract was rarely examined.

For mouse inoculation, the spleen or part of the liver, sometimes both, were emulsified in 3 to 6 cc. of sterile distilled water and 0.5 cc. of the emulsion was injected intraperitoneally into white mice. Since it is often impossible to make a positive morphological diagnosis from the originally inoculated mice, subsequent mouse to mouse transfers were made at 4- to 12-day intervals, using the emulsified mouse spleen as the inoculum. Generally by the third transfer definite evidence of the presence of the virus appears if the tissue was infected.

A portion of each tissue emulsion was inoculated on a plain agar slant and incubated at 37° C. for a minimum of 6 days. When massive bacterial contamination appeared or when an organism of especially high virulence for mice was present, additional material was passed through either a Berkfeld N or a Seitz pad and mouse inoculation was begun anew. Material from 5 of the positive birds was successfully filtered although there was apparently a moderate loss of virus in the process.

For a mouse to be considered positive after inoculation with suspected material, two morphologic criteria must be demonstrable. The first of these is the presence in mononuclear cells of the psittacosis bodies or Levinthal-Coles-Lillie (L. C. L.) bodies. Cells bearing these structures are most readily found in peritoneal impression smears. Less constantly in sections, the bodies may be seen in the inflammatory exudate covering the liver or spleen capsule and sometimes also in Kupffer cells, reticulum cells of the spleen, and in inflammatory cells in liver lesions. The second evidence, somewhat irregular in its time of appearance, consists of multiple foci of liver cell necrosis free of bacteria. In addition to these two diagnostic morphologic features, after repeated mouse transfers the virus must be capable of killing white mice in 2 to 8 days, using 0.5 cc. of a 1 to 20 mouse spleen emulsion.

Some birds, notably parrakeets, from which virus can later be recovered will show pathological changes insufficient to warrant a definite diagnosis of psittacosis. For this reason the mouse inoculation procedure is by far the most reliable and important method of diagnosis.

A direct morphologic diagnosis upon bird tissues as received is somewhat more uncertain and difficult because of the unknown duration of the disease process and other variables such as species differences, complicating disease processes, and poor tissue preservation. In a number of the birds examined from this outbreak, a positive histologic diagnosis based on the demonstration of L. C. L. bodies and focal necrosis or cellular nodules in the viscera was possible. However, virus was recovered from some birds which failed to present lesions sufficiently characteristic for diagnosis.

In table 1 are presented the data on the 15 birds found positive on examination. In 11, a definite direct histological diagnosis of psittacosis was made. Owing to autolysis, no tissue was examined from one (No. 54). One (No. 13) showed a marked subacute nephritis, but no L. C. L. bodies could be identified with certainty. In 2 (Nos. 12 and 45), there was focal liver necrosis without definite L. C. L. bodies, but suggestive structures were seen in the capsular exudate in the first and in renal tubules in the second.

The size of the spleens varied greatly, some being 2.5 cm. in diameter while others were considered as of normal dimensions. In no case did the lungs show any significant lesions. All of the 14 positive birds from which tissue was examined presented visible damage either in the liver or kidney, while L. C. L. bodies were identified in 11. All 14 livers showed focal infiltration, 12 showed necrosis, and L. C. L. bodies were present in 7. Each of the 13 kidneys examined showed interstitial infiltration and tubular necrosis. Typical psittacosis bodies were seen in 11 and intracellular granules of suspicious but not typical appearance were seen in the other 2 kidneys. In 4 birds L. C. L. bodies were found in the kidney when prolonged search failed to reveal them in the liver, but in no case was the converse true. Since psittacosis bodies appeared in 84.6 percent of the kidneys and in only 50 percent of the livers, it would seem advisable always to include sections of kidney tissue in the histological examination of suspected birds.

Material from 14 of the positive birds was inoculated intraperitoneally into white mice. Seven of these gave positive results on the initial transfer, 5 on the second, and 2 on the third passage. Virus from 1 bird was carried through five serial passages and from another it was propagated through two separate series of 4 transfers each. In the remaining cases, the number of mouse passages varied from 1 to 4.

TABLE 1

Date received	Bird No.	Pathology No.	Name of bird	Liver			Kidney			Mouse inoculation
				Necrosis	Infiltration	L. C. L. bodies	Necrosis	Infiltration	L. C. L. bodies	
Jan. 21, 1941	1	19456	Yellow-headed parrot (*Amazona ochrocephala*)	+	++	++	±	+++	+	Positive on first transfer.
Do	2	19457	Festive parrot (*Amazona festiva*)	+	++	++	+	+	+	Do.
Jan. 23, 1941	3	19466	Double yellow-headed parrot (*Amazona ochrocephala*)	+++	++	+++	+	++	+	Not done.
Jan. 30, 1941	12	19542	Orange-winged parrot (*Amazona amazonica*)	+	+	−	(1)	(1)	(1)	Positive on first transfer.
Do	13	19543	Java sparrow (*Munia oryzivora*)	±	+	−	+	+	(?)	Positive on second transfer.
Feb. 27, 1941	41	19707	Double yellow-headed parrot (*Amazona ochrocephala*)	−	++	−	++	++	++	Positive on third transfer.
Mar. 6, 1941	45	19809	Boquet's parrot (*Amazona arausiaca*)	+	+	−	+	±	(?)	Positive on first transfer.
Do	46	19810	African red-eyed dove (*Streptopelia semitorquata*)	+	++++	++++	+	+	+	Do.
Mar. 8, 1941	47	19823	Double yellow-headed parrot (*Amazona ochrocephala*)	−	+++	−	++	+++	+++	Do.
Mar. 12, 1941	50	19826	do	+	++	−	±	±	±	Positive on second transfer.
Mar. 17, 1941	53	19829	African gray parrot (*Psittacus erithacus*)	+	+++	+	+	++	+	Do.
Do	54	19830	Double yellow-headed parrot (*Amazona ochrocephala*)	(2)	(2)	(2)	(2)	(2)	(2)	Do.
Do	55	19831	African red-eyed dove (*Streptopelia semitorquata*)	+	+	+++	+	+	±	Do.
Mar. 29, 1941	60	19932	Double yellow-headed parrot (*Amazona ochrocephala*)	±	+	−	+	+	+	Positive on third transfer.
April 7, 1941	63	19997	do	++	++	+++	+	+	+	Positive on first transfer.

[1] No tissue.

[2] Autolyzed.

Of the 15 infected birds, 11 were South American parrots (*Amazona*), 1 was an African gray parrot (*Psittacus*), 1 a Java finch (*Munia*), and 2 were African doves (*Streptopelia*). All of these birds came from the bird house, the Amazons and the African gray from the parrot room which is located at one end of the building and opens into the large entrance hall by means of a double door. At the opposite end of this hall is a similar room where the finch was caged. The African doves occupied a more central position in the house, the cages having their backs placed against the solid partition forming one wall of the parrot room.

In table 2 are listed the 43 birds in which no evidence of psittacosis could be demonstrated. Included here are the 6 dying outside the bird house proper and 4 of the Amazons which were killed because of suspicious symptoms. It is quite possible that many of the finches dying during the first few days of February were victims of the vapor from the solution of formalin used for disinfection of the premises.

TABLE 2

Date received	Bird No.	Pathology No.	Name of bird	Tissue examination	Mouse inoculation
Jan. 28, 1941	4	19530	Yellow-headed parrot (*Amazona ochrocephala*).	Bacteremia, type undetermined.	Bacteremia.
Do	5	19529	Finch (*Munia* ?)	Negative	Negative.
Jan. 30, 1941	7	19537	Double yellow-headed parrot (*Amazona ochrocephala*).	do	Do.
Do	8	19538	Orange-winged parrot (*Amazona amazonica*).	Granulomata in liver (undetermined etiology).	Do.
Do	10	19540	Yellow-headed parrot (*Amazona ochrocephala*).	Negative	Do.
Do	11	19541	Yellow-naped parrot (*Amazona auropalliata*).	do	Do.
Do	14	19544	Java sparrow (*Munia oryzivora*)	do	Do.
Do	15	19552	Liberian crested eagle (*Stephanoaetus coronatus*).	Focal necrosis in liver (undetermined etiology).	Do.
Do	16	19551	Silver gull (*Larus novaehollandiae*)	Negative	Do.
Feb. 3, 1941	17a	19572	Long-tailed finch (*Poephila acuticauda*).	do	Do.
Do	17b	19573	do	do	Do.
Do	17c	19574	do	do	Do.
Do	17d	19575	do	do	Do.
Do	18a	19576	Gouldian finch (*Poephila gouldiae*)	do	Do.
Do	18b	19577	do	do	Do.
Do	19	19578	Banded finch (*Steganopleura bichenovii*).	do	Do.
Do	21	19581	do	do	Do.
Feb. 5, 1941	22	19584	Mallard duck (*Anas platyrhynchos*)	Focal necrosis in liver (undetermined etiology).	Do.
Feb. 7, 1941	24	19592	Fischer's lovebird (*Agapornis fischeri*).	Negative	Do.
Feb. 8, 1941	26	19594	Palawan peacock pheasant (*Polyplectron napoleonis*).	Pneumonia with abscesses.	Do.
Do	27	19595	Black crested finch (*Lophospingus pusillus*).	Negative	Do.
Do	29	19597	Orange-chinned parrot (*Brotogeris jugularis*).	Perirenal abscess	Do.
Feb. 10, 1941	30	19598	Bald eagle (*Haliaeetus leucocephalus*).	Trematode in bile duct	Do.
Do	31	19599	Mallard duck (*Anas platyrhynchos*)	Negative	Do.
Do	32	19600	Pintail (*Dafila acuta*)	do	Do.
Feb. 11, 1941	33	19618	Indian black-necked stork (*Xenorhynchus asiaticus*).	Old generalized parasitic infestation.	Do.

TABLE 2.—Continued

Date received	Bird No.	Pathology No.	Name of bird	Tissue examination	Mouse inoculation
Feb. 20, 1941	35	.....	Diuca finch (*Diuca diuca*)	No tissue	Negative.
Do	36	19679	Leadbeater's cockatoo (*Kakatoe leadbeateri*).	Negative	Do.
Feb. 25, 1941	37	19690	Diuca finch (*Diuca diuca*)	do	Do.
Do	38	19691	Gouldian finch (*Poephila gouldiae*)	do	Do.
Feb. 27, 1941	39	.....	Shiny cowbird (*Molothrus bonariensis*).	No tissue	Do.
Do	40	19708	Kiskadee flycatcher (*Pitangus sulphuratus*).	Negative	Do.
Mar. 3, 1941	42	19735	Crested fire-back pheasant (*Diardigallus diardi*).	Trematode worm in kidney pelvis.	Do.
Do	43	19736	Migratory quail (*Coturnix coturnix*).	Tuberculosis; retained egg.	Tuberculosis.
Do	44	19737	Saffron finch (*Sicalis flaveola*)	Negative	Negative.
Mar. 8, 1941	49	19825	Migratory quail (*Coturnix coturnix*).	Tuberculosis	Tuberculosis.
Mar. 12, 1941	51	19827	Ground pigeon (*Geopelia striata*)	Negative	Negative.
Mar. 17, 1941	56	19832	Tambourine dove (*Tympanistria tympanistria*).	Marked autolysis	Do.
Mar. 22, 1941	57	19874	Screech owl (*Otus asio*)	Negative	Do.
Do	58	19875	Diuca finch (*Diuca diuca*)	do	Do.
Mar. 25, 1941	59	19893	Ring dove (*Turtur risorius*)	do	Do.
Apr. 2, 1941	61	19978	Screech owl (*Otus asio*)	Marked fatty degeneration of liver.	Do.
Do	62	19979	Diuca finch (*Diuca diuca*)	Fatty degeneration of liver.	Do.

In this group there were several incidental findings of some interest. From parrot No. 4 a small, gram-negative coccobacillus was isolated which proved highly virulent for mice, causing death within 20 hours. Marked confluent lobular pneumonia with abscesses was present in pheasant No. 26. Parrot No. 29 showed an abscess in the region of the left kidney and sex organs. In bald eagle No. 30 a trematode parasite completely filled a large bile duct. An Indian stork (No. 33) showed marked serosal and visceral dissemination of small, focally calcified, parasitic cysts of an undetermined nature. In a second pheasant (No. 42) one kidney pelvis contained a portion of a trematode worm. Two migratory quails (Nos. 43 and 49) showed extensive avian tuberculosis, while the former in addition had a 5 by 3 cm. retained egg, partially encapsulated and decomposed. A screech owl (No. 61) presented marked diffuse fatty degeneration of the liver, while a finch (No. 62) showed a similar moderate and focal process.

Two birds not included in either table 1 or table 2 were considered doubtful. A double yellow-headed parrot (*Amazona ochrocephala*) (No. 9) gave negative results on mouse inoculation in spite of the presence of a very large spleen and many foci of degenerating parenchymal cells and infiltrating leucocytes in the liver. Serial passage of this material through 4 groups of mice resulted in only 1 death on the eleventh day in the initial transfer. Examination of the second bird, a ground pigeon (*Geopelia striata*) (No. 52), gave such inconsistent results that one must feel reluctant to classify it as psittacotic.

The bird's tissues presented no characteristic lesions, and no typical L. C. L. bodies were found in the liver or kidney. Inoculation of tissue emulsion into mice produced granulomatous lesions in some animals after 5 to 8 days but no typical L. C. L. bodies could be demonstrated in the spleens or livers of such animals. However, in a few mice larger intracellular bodies of uncertain nature were seen in peritoneal impression smears and in capsular exudate on the surface of the liver in sections. Consistent and characteristic results could not be obtained even after passing the material through two separate series of 4 mouse passages each

It is highly probable that the original source of the infection causing the outbreaks just described will never be discovered. Epidemiological investigation is hopelessly complicated by the custom long practiced of receiving as gifts or loans occasional birds from outside donors. Birds so acquired were housed indiscriminately with those of the general collection. Since September 1938, 12 grass parrakeets (*Melopsittacus undulatus*) were thus received, the last 4 being taken June 19, 1940. During the past year several canaries and 2 toucans, but apparently no parrots, were obtained in this manner. During the fall of 1940, however, a single parrot belonging to the collection was loaned out for a brief time in Arlington County, Va., and was returned to the park after a few days. A large group of nonpsittacine birds consisting mainly of finches was imported from South America in April 1940, and 5 African doves were brought from Liberia the following month. The last large importation of psittacine birds into the bird house came from Sumatra in the fall of 1937. At that time the 39 birds dying during the quarantine period were examined here with negative results.

The preceding catalogue of importations unfortunately does not furnish any clear information on the possible source of the infection. Of the birds dead of psittacosis, the last date of contact with natural environment can be determined only in the case of the 2 doves. As noted above, these arrived from Liberia May 17, 1940. The finch was obtained from Sumatra in 1937. The African gray parrot had been in private possession for a number of years before being donated to the park in 1930. By far the largest group of infected birds consisted of the Amazons and unfortunately these had been acquired from diverse sources over a long period of time and their individual identity was lost when they were incorporated into the general collection. They, therefore, can contribute no information on the possible source of infection.

Since even the most recently acquired birds had been under observation in captivity for a considerable period, the possibility that the infection had been introduced by an apparently healthy carrier may be considered. Such a carrier may have become an active shedder of

virus due to some break-down in general health. Some support is furnished this theory by the fact that a temporary break-down of the heating system of the bird house had occurred about a week before the first appearance of psittacosis among the birds. It is well known that these tropical and subtropical birds are very sensitive to changes in temperature and that even a brief exposure to cold greatly lowers their resistance. It is likewise recognized that chilling, unsanitary environment, and improper feeding will often turn an apparently previously healthy bird, that is, one with subclinical psittacosis, into an active shedder of the virus.

The first human contact case was that of an assistant keeper whose only previous association with birds had been in his own home. He entered upon duty in the bird house on December 9, 1940, and became ill 33 days later. The remaining 7 employees have been regularly employed there for periods ranging from 3 to 20 years. These may have escaped infection because of some degree of natural immunity developed through prolonged intermittent contact with birds; however, it seems more probable that the sick attendant acquired his infection through concentrated exposure to virus-bearing birds. Although all the men worked in the parrot room at various times, the new employee spent the entire morning, 6 days a week, in cleaning and feeding in that room. After he became ill, his work was taken over almost entirely by the principal keeper, who in turn fell sick on April 9, 1941. Since neither patient was able during his illness to raise a satisfactory specimen of sputum, no material was available from which to attempt isolation of the virus. The diagnosis of psittacosis was made by the attending physicians on history of exposure, clinical findings, and serial X-ray examination of the lungs. Both patients have since recovered from the illness.

Fortunately there have been no reported cases of psittacosis among the residents of or visitors to the city of Washington, D. C. At the National Zoological Park it has been the routine custom to clean all cages thoroughly early each morning, to isolate promptly all sick birds, and to keep the public at a distance from the birds by means of either glass fronts or guard rails placed 3 feet in front of all open cages. The observance of these sanitary precautions, followed by the prompt closing of the bird house as soon as the infection was recognized, has probably prevented the spread of psittacosis to visitors to the park. Their exposure to the virus, even during the last few days the house remained open, must have been very slight.

Following the closure of the bird house on January 25, the District of Columbia Health Department and the National Zoological Park personnel instituted certain measures aiming at control of the epizootic. These included the wearing of masks by the attendants, the

prompt isolation of all sick birds, the daily spraying of all cages with a weak solution of formalin and the removal of all excreta and refuse in a wet state. After the appearance of the second human case, the 16 remaining Amazons in the house, though apparently healthy, were killed. No histologic evidence of psittacosis was found in these birds and since mouse inoculation could not be done at that time, these parrots are not included in the preceding discussion.

On May 6, 1941, after consultation with the District of Columbia Health Department, the director of the park opened to the public a small portion of the bird house from which no virus-bearing birds had been obtained. The reopened section consists of a large hall placed at the extreme back of the house, having a separate rear entrance and containing all glass-enclosed cages. It is now completely closed off from the rest of the building containing the three rooms from which the positive birds were obtained.

This partial reopening was authorized by the responsible officials because all the Amazons had been disposed of, the last virus-bearing parrot had died 1 month before, and the last nonpsittacine bird known to have been infected had died 7 weeks previously. Consequently it was felt that visitors were no longer exposed to any appreciable risk of infection, and that such part of the bird collection as was housed in the supposedly uncontaminated section of the building could once more safely be opened to public inspection.

SUMMARY

An outbreak of psittacosis among birds in the National Zoological Park in Washington, D. C., is reported. Fifteen birds positive for psittacosis were discovered among 60 dying or killed during the epizootic. These consisted of 12 parrots, both South American and African, 1 finch, and 2 African doves. The technique of laboratory diagnosis of infected birds is briefly discussed. Two of the 8 bird house employees developed clinical psittacosis but have since recovered. No cases of the disease have been reported among the general population. Control measures taken by the local authorities to eradicate the disease in the bird collection and prevent its spread to the general population have been described.

ACKNOWLEDGMENTS

The author gratefully acknowledges his indebtedness to Dr. William M. Mann, Director, and Mr. Malcolm Davis, Principal Keeper, at the National Zoological Park for furnishing the material for this study and to Dr. Herbert Friedmann, Curator of Birds, National Museum, for identifying the birds examined.

QUANTITATIVE STUDIES OF THE TUBERCULIN REACTION

I. Titration of Tuberculin Sensitivity and its Relation to Tuberculous Infection [1]

By MICHAEL L. FURCOLOW, *Assistant Surgeon, United States Public Health Service*, BARBARA HEWELL, *Pediatrician, Anti-Tuberculosis League*, WALDO E. NELSON, *Professor of Pediatrics, Temple University*, and CARROLL E. PALMER, *Passed Assistant Surgeon, United States Public Health Service*

It is common practice to consider that the tuberculin test, within the limits of dosage ordinarily employed, will detect all persons who are capable of reacting to tuberculin. There does not seem to be conclusive evidence, however, that the usual second strength dose of tuberculin is the limit of dosage which will detect all reactors (*1–3, 8*). It is well known that a definite percentage of persons who are negative to the first test dose will react to the second test dose. Will an increasing proportion of persons react as the quantity of tuberculin is increased? If this is true, will the maximum number of reactors who can be detected by even the largest doses of tuberculin be the correct index of those infected with the tubercle bacillus? Or, will reactors to the larger doses be related in a different manner to tuberculous infection than reactors to the smaller doses?

The present study was undertaken in an attempt to answer some of the questions presented above. It was decided to use a more accurately quantitative method of tuberculin testing than the ordinary two-dose method. This method consisted in the use of a number of doses of tuberculin of different concentrations so that there could be determined the lowest dose (in milligrams) of tuberculin to which each individual would react. The application of the same method to various population groups allows comparisons to be made among the groups not only as to tuberculin sensitivity but as to contact with the tubercle bacillus, age, and other factors.

MATERIAL AND METHODS

Plan of study.—The general plan of the study was to test the members of several different population groups, employing a graduated series of increasing concentrations of tuberculin. Thus, all of the persons in a particular group were tested initially with an exceedingly dilute concentration of tuberculin. Those who did not show a reaction to this test were retested 4 days later with a more concentrated solution. Those who still failed to have a reaction were tested again with a higher concentration. This procedure was continued step by step, eliminating the reactors, and retesting the nonreactors with a more concentrated solution until either all those tested reacted, or the largest dose in the graduated series was given.

[1] From the Division of Public Health Methods, National Institute of Health, and the Children's Hospital Research Foundation, Department of Pediatrics, University of Cincinnati.

The tuberculin.—Dilutions from a single lot of tuberculin PPD were used for all of the tests. Two grams of PPD, lot number 98970, were obtained through the courtesy of Dr. Florence Seibert of the Henry Phipps Institute. This product was standardized by Doctor Seibert at the beginning and at the completion of the study. She reported that this lot of PPD was "about one-half as potent" as her standard, but that it was essentially equal in strength to commercial PPD, and that there appeared to be no loss of potency during the period of study.

The entire 2-gram sample of PPD was preserved as a 2-percent solution in physiologic saline with 0.5 percent phenol. Repeated cultures failed to reveal any evidence of bacterial contamination. Chemical glassware and pipettes were employed for the dilutions which were made by one person within 24 hours of use. Glassware, pipettes, and syringes were cleansed by boiling for 10 minutes in strong soap solution and then were immersed for at least 24 hours in strong sulfuric acid-dichromate cleaning solution. This was done before and after use to destroy any adherent tuberculin (*4*).

Schedule of dosage.—Twelve doses of tuberculin were employed, ranging from 1/100 billionth of a milligram in 0.1 cc. to 1.0 mg. in 0.1 cc. of physiologic saline solution. The concentration of tuberculin increased ten times with each succeeding test. The schedule of dosage is shown in table 1.

TABLE 1.—*Schedule of the dose of tuberculin used in the various tests*

Test No.	Dose of PPD in mg. in 0.1 cc.	Test No.	Dose of PPD in mg. in 0.1 cc.
1	0.00000000001 (1/100 billionth).	7	0.00001 (1/100 thousandth).
2	0.0000000001 (1/10 billionth).	8	0.0001 (1/10 thousandth).
3	0.000000001 (1/1 billionth).	9	0.001 (1/1 thousandth).
4	0.00000001 (1/100 millionth).	10	0.01 (1/100th).
5	0.0000001 (1/10 millionth).	11	0.1 (1/10th).
6	0.000001 (1/1 millionth).	12	1.0 (1 mg.).

The complete schedule of 12 tests was not followed for the testing of all the population groups. While the tests omitted varied with the different groups, all groups received each of the last 6 tests (tests 7 to 12, inclusive).

Testing procedure.—The tests were performed by the intracutaneous method, new syringes and needles being employed; 0.1 cc. of the required dilution of tuberculin was injected into the flexor surface of the forearm. A different site was employed for each injection, progressing from above distally to avoid accentuation of the reaction by drainage of tuberculin through the lymphatics. The reactions were read at 24, 48, and 72 hours, and measurements were recorded in millimeters for the two greatest diameters of both edema (induration) and erythema. In the analysis of the data, the size of the area

of either edema or erythema was considered to be the average of the measurements of their respective diameters. In this study the term "positive reaction" refers to a reaction with an area of edema (induration) whose average diameter measured 5 mm. or more at the time of the 48-hour reading. A reaction consisting of erythema only was considered negative, irrespective of size.

The procedures for testing each group were essentially identical. An initial test employing one of the dilute solutions of tests 1 to 7 (table 1) was administered to each person. Increasingly larger doses of tuberculin were injected in those who had no reaction or a reaction consisting of an area of induration of less than 10 mm. It is to be noted that the criterion for elimination from further testing (10 mm. or more of edema at 48 hours) was different from that employed for the determination of positive reactions (5 mm. or more of edema at 48 hours). This was done to make certain that the smaller reactions were actually positive ones and not artifacts.

Definition of terms.—The testing of a person by the procedure outlined above determines the smallest dose of tuberculin PPD to which he will react. This dose may be defined as the "sensitivity level" of that individual. The application of this testing procedure to any population group determines the "sensitivity levels" of all of its members. For example, a certain number of the population will fall into the most sensitive class (those reacting to the smallest dose), others will react to the next larger dose, and so on until the largest dose is reached. The remainder will consist of those who do not react even to the largest dose. In order to determine the total number of persons who would react to any given dose if the entire population were tested with that dose alone, it is necessary to add the number of reactors to that dose and to all the smaller doses, since it may be assumed that those who react to any of the smaller doses would also react to a larger dose. For example, if test number 5 alone were applied to the entire population the number of reactors to that dose would be the number reacting to tests 1, 2, 3, 4, and 5. Therefore, in order to obtain the number of reactors to each of the doses if used alone the number reacting to the various test doses was accumulated as above and called the "accumulated number of positive reactors" to each test dose. When expressed as a percentage of the entire population tested, this accumulated number becomes the "accumulated percentage of positive reactors" to the various test doses of tuberculin. The plotting of the accumulated percentage of positive reactors against dosage results in a curve which may be defined as the "sensitivity curve" for the population under discussion. Thus, a population composed of a high percentage of persons hypersensitive to tuberculin would have a curve rising sharply for the smaller doses whereas a relatively insensitive population would

not present this sharp rise for the smaller doses. Precise comparison of the "sensitivity curves" for the various population groups is possible since the same technique and the same tuberculin solution were employed throughout.

Population groups tested.—Since the quantitative determination of sensitivity to tuberculin requires repeated tests, it appeared more practical to study institutional groups. There was also a greater likelihood that all of the group, including the staff, could be examined clinically and roentgenographically. It is recognized that institutional groups may not represent adequately the general population, but the difficulties involved in repeated testing of any general population group are obvious.

Nontuberculous groups.—Children: The original group tested consisted of 553 white children residing in an orphanage in Ohio. These children ranged in age from 6 to 19 years, 83 percent of them being 12 years of age or older. Of the total group, 56 percent were boys and 44 percent were girls. A roentgenogram of the chest was made of each of the children and of each of the 200 adults in the institution. When there was evidence indicating the possibility of a tuberculous lesion, the person was carefully studied by other clinical methods. No proved active tuberculosis was found among either the adults or the children in the orphanage.

Infants and young children: In this group there were 116 infants and young children ranging in age from birth to 6 years who were residents of two foundling homes. No roentgenographic evidence of pulmonary tuberculosis was found in the children of either institution. Roentgenographic studies were not made of the adults in these institutions.

Tuberculous and contact groups.—Children: Three different groups were tested: (1) 60 children who were patients in a hospital for active tuberculosis; (2) 46 children in a preventorium for inactive cases of tuberculosis and for children who had had intimate contact with tuberculosis; and (3) 101 children in an antituberculosis camp, about 60 percent of whom had a history of probable contact with active tuberculosis. These children ranged in age from a few days to 14 years. Clinical and roentgenographic studies, as well as family investigations, were made on all of the children in each of these groups.

Adults: The first group under this heading consisted of the entire adult population of a hospital for the treatment of active tuberculosis. There were 468 white and colored patients ranging in age from 15 to 70 years, whose clinical diagnoses varied from minimal to far advanced tuberculosis. Less than 10 percent of this group were reported to have had a tuberculin test previously. Clinical and roentgenographic data in relation to tuberculous disease were available for these patients.

The second group consisted of 499 adults ranging in age from 15 to 60 years who were inmates of an institution for the insane. Since more than 10 percent of this group were found to have active tuberculosis, the remaining patients were considered as tuberculous contacts. Roentgenograms of the chests were made of all of the inmates, and those who were suspected of having tuberculosis were subjected to further clinical study.

RESULTS

Nontuberculous groups.—Children 6 to 19 years of age: The results of the quantitative testing of the 553 children in the orphanage are presented in table 2 and figure 1. In table 2 are shown the number of positive reactors as well as the accumulated number and accumulated percentage of positive reactors to the various test doses of tuberculin PPD. Figure 1 illustrates the accumulated percentage of positive reactors, or the "sensitivity curve" for this group. The vertical lines, marked I and II, on this and on all succeeding figures represent, respectively, the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

TABLE 2.—*Number and percentage of children positive [1] to various test doses of tuberculin PPD among 553 white boys and girls aged 6–19 years in an orphanage*

Test No.	Tuberculin PPD, test dose in mg.	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)			
2	0.0000000001 (1/10 billionth)			
3	0.000000001 (1/1 billionth)			
4	0.00000001 (1/100 millionth)	1	1	0.2
5	0.0000001 (1/10 millionth)			
6	0.000001 (1/1 millionth)			
7	0.00001 (1/100 thousandth)	94	95	17.2
8	0.0001 (1/10 thousandth)	16	111	20.1
9	0.001 (1/1 thousandth)	84	195	35.3
10	0.01 (1/100th)	131	326	59.0
11	0.1 (1/10th)	159	485	87.7
12	1.0 (1 mg.)	46	[4] 531	96.0

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 22 cases which were negative to all tests.

It will be noted in figure 1 that there is a steady increase in the accumulated percentage of positive reactors with increase in the dosage of tuberculin. Approximately 20 percent of the children had positive reactions at the level of the usual first testing dose of PPD, 50 percent at the level of the second testing dose, and 96 percent at the largest dose, 1.0 mg. of tuberculin. It is seen that in this group of children the percentage of reactors to tuberculin is directly related to dosage, since with proper selection of dosage any desired percentage from 0.2 percent to 96 percent would be obtained.

In view of the absence of cases of significant active tuberculosis among either the children or the adults in the institution, data were obtained concerning the history of contact of the children with tuberculosis prior to admission to the institution. Family histories taken by social workers were available on 309 of the children. Of these, 61 had a history of contact with tuberculosis before admission to the orphanage but 248 had no obtainable history of contact. Approximately 20 percent of this group, therefore, had a positive history of contact.

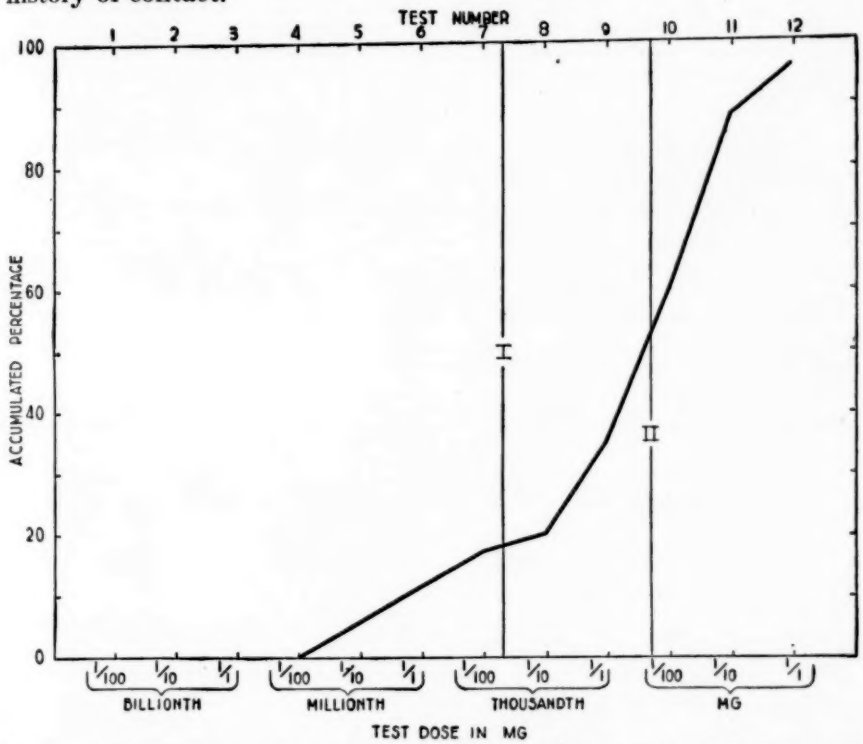

FIGURE 1.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 553 white boys and girls aged 6–19 years in an orphanage. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

The response to tuberculin of the children with a history of contact with tuberculosis and of those with no history of contact is shown in table 3 and figure 2. It is evident that the children with a history of contact were much more sensitive to tuberculin than were the children of the entire orphanage group. Conversely, the children who had no history of contact with tuberculosis were less sensitive. The increased sensitivity of those with a positive history of contact may be illustrated by the response to test number 7, which is slightly less concentrated than the usual first testing dose of PPD. At this level only 6.5 percent of the children without a history of contact

had positive reactions in contrast to 77 percent of the children with a history of contact with tuberculosis.

TABLE 3.—*Number and percentage of children positive [1] to various test doses of tuberculin PPD among 309 white boys and girls aged 6–19 years in an orphanage, arranged according to their contact with tuberculosis*

Test No.	Tuberculin PPD, test dose in mg.	61 children with a positive history of contact with tuberculosis			248 children with no history of contact with tuberculosis		
		Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)						
2	0.0000000001 (1/10 billionth)						
3	0.000000001 (1/1 billionth)						
4	0.00000001 (1/100 millionth)	1	1	1.6	0	0	0
5	0.0000001 (1/10 millionth)						
6	0.000001 (1/1 millionth)						
7	0.00001 (1/100 thousandth)	46	47	77.0	16	16	6.5
8	0.0001 (1/10 thousandth)	1	48	78.7	5	21	8.5
9	0.001 (1/1 thousandth)	2	50	82.0	45	66	26.6
10	0.01 (1/100th)	4	54	88.5	67	133	53.6
11	0.1 (1/10th)	7	61	100.0	77	210	84.7
12	1.0 (1 mg.)	0			22	[4] 232	93.5

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 16 cases which were negative to all tests.

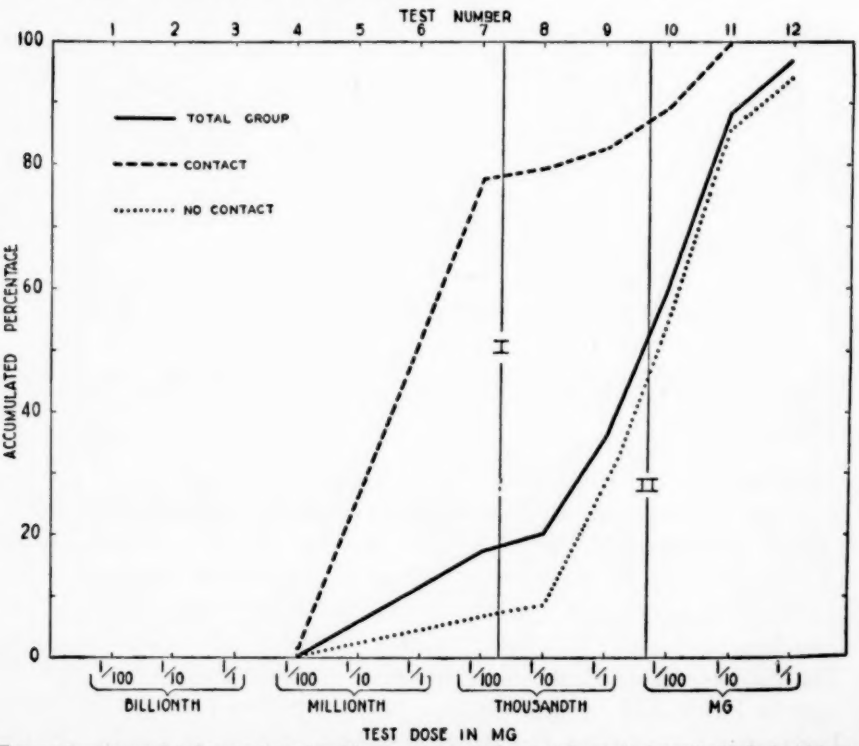

FIGURE 2.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD, by history of contact with tuberculosis among 309 of the 553 boys and girls in an orphanage. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

Infants and young children: The possibility must be considered that most of the children in the orphanage had some unknown contact with the tubercle bacillus which would explain the fact that 96 percent of them reacted to tuberculin when large doses were injected. Therefore, it appeared desirable to test another group in which there was less likelihood of contact with tuberculosis. For this purpose infants and small children in two foundling homes were chosen. The numerical results are shown in table 4, and the "sensitivity curve" or accumulated percentage of positive reactors to the various test doses, in figure 3. Included for comparison in this figure is the sensitivity curve for the 248 children of the orphanage who had no known history of contact with tuberculosis (from fig. 2). Although there were no reactors to the smaller doses of tuberculin, most of the infants, including those under 6 months of age, reacted to the larger doses. Thus, a high percentage of children react to tuberculin if sufficiently large doses are injected. It is also seen from the figure that sensitivity to tuberculin tends to increase with age, the curve for the children aged 4 to 6 years approaching the curve for those children aged 6 to 19 years who had no known history of contact with tuberculosis. As age increases, however, the opportunities for unknown contact with the tubercle bacillus also increase.

TABLE 4.—*Number and percentage of infants and young children positive [1] to various test doses of tuberculin PPD among 116 white boys and girls from birth through 6 years of age in 2 foundling homes*

Test No.	Tuberculin PPD, test dose in mg.	(1) 32 infants under 6 months of age			(2) 65 children aged 6 months through 3 years			(3) 19 children aged 4 through 6 years		
		Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)									
2	0.0000000001 (1/10 billionth)									
3	0.000000001 (1/1 billionth)									
4	0.00000001 (1/100 millionth)									
5	0.0000001 (1/10 millionth)									
6	0.000001 (1/1 millionth)									
7	0.00001 (1/100 thousandth)	0	0	0	0	0	0	0	0	0
8	0.0001 (1/10 thousandth)	0	0	0	0	0	0	1	1	5.3
9	0.001 (1/1 thousandth)	0	0	0	0	0	0	1	2	10.5
10	0.01 (1/100th)	0	0	0	9	9	13.8	4	6	31.6
11	0.1 (1/10th)	7	7	21.9	39	48	73.8	9	15	78.9
12	1.0 (1 mg.)	16	[4] 23	71.9	14	[5] 62	95.4	3	[6] 18	94.7

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 9 cases which were negative to all tests.
[5] In addition there were 3 cases which were negative to all tests.
[6] In addition there was 1 case which was negative to all tests.

Tuberculous and contact groups.—Children: In table 5 and figure 4 are presented the sensitivity curves of three groups of children: (1) Those with active tuberculosis; (2) those who were healed cases or who had a history of known contact (preventorium); and (3) those in an antituberculosis camp, 60 percent of whom were reported to have a history of contact with tuberculosis.

It is seen that the sensitivity of the various groups of children to tuberculin increases with the proportion of persons in the group who

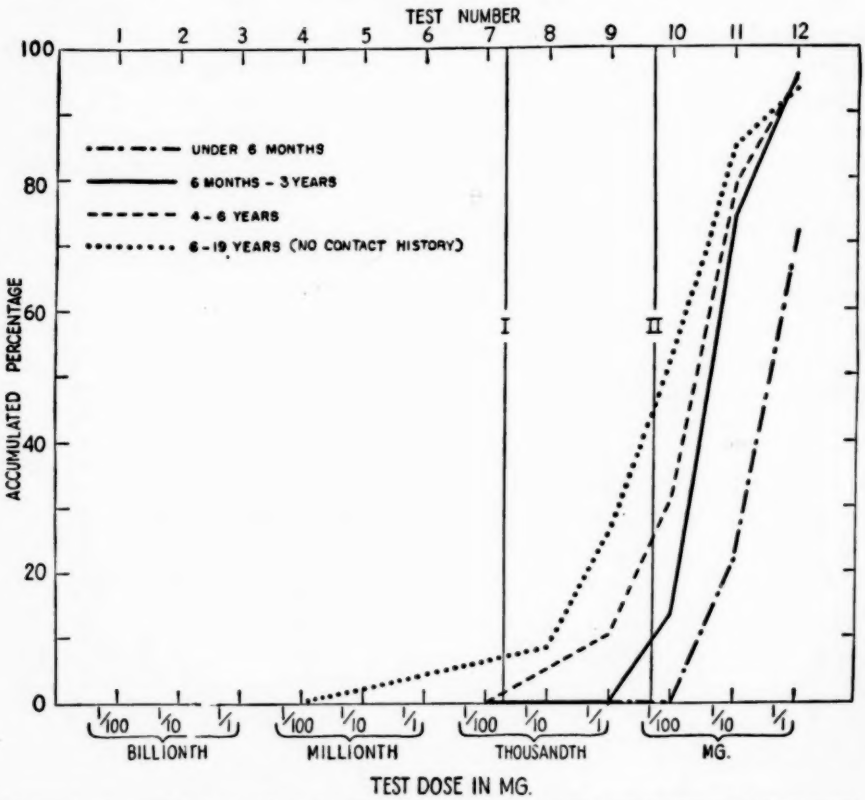

FIGURE 3.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 116 infants and young children aged from birth through 6 years, and 248 older children who had no known history of contact with tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

have had known contact with tuberculosis. Thus, the children in the antituberculosis camp, 60 percent of whom had a history of contact, are more sensitive than those of the orphanage group, of whom 20 percent had a history of contact. The children of the preventorium, all of whom were known contacts, have a higher percentage of reactors to the lower test doses. This sensitivity to the lower doses is even more marked among the children with active tuberculosis, approximately 95 percent of whom react at a level of dosage equivalent to the usual first testing dose of PPD and all of

whom reacted at a dosage level only five times as concentrated, or test number 8 (1/10,000 mg.). In contrast, only 20 percent of the orphanage group and 42 percent of the children in the antituberculosis camp had reactions to this testing dose.

TABLE 5.—*Number and percent of positive [1] reactors to various test doses of tuberculin PPD among 207 white and colored children from birth through 14 years of age with variable tuberculosis background. Tabulated separately are 60 children with active tuberculosis, 46 children who were contacts or healed cases of tuberculosis, and 101 children who were suspected of contact with tuberculosis*

Test No.	Tuberculin PPD, test dose in mg.	60 children with active tuberculosis			46 children in a preventorium			101 children in an antituberculosis camp		
		Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)				0	0	0	0	0	0
2	0.000000C001 (1/10 billionth)									
3	0.000000001 (1/1 billionth)	2	2	3.3						
4	0.00000001 (1/100 millionth)	7	9	15.0	7	7	15.2	0	0	0
5	0.0000001 (1/10 millionth	4	13	21.7						
6	0.000001 (1/1 millionth)	26	39	65.0	21	28	60.9	9	9	8.9
7	0.00001 (1/100 thousandth)	17	56	93.3	5	33	71.7	17	26	25.7
8	0.0001 (1/10 thousandth)	4	60	100.0	2	35	76.1	16	42	41.6
9	0.001 (1/1 thousandth)				1	36	78.3	12	54	53.5
10	0.01 (1/100th)				3	39	84.8	19	73	72.3
11	0.1 (1/10th)				4	43	93.5	18	91	90.1
12	1.0 (1 mg.)				3	46	100.0	9	[4] 100	99.0

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there was 1 case which was negative to all tests.

Adults: Table 6 shows the data for 468 tuberculous adults and figure 5 illustrates their sensitivity curve. Included in this figure are the sensitivity curves for the tuberculous children (from fig. 4) and for the total orphanage group (from fig. 1). The similarity of the curves for the tuberculous adults and children is seen in figure 5. This is further evidence that reactions to small doses of tuberculin, or skin hypersensitivity, occur with great regularity in persons with active tuberculosis. The adults are seen to be slightly less sensitive than the children. For example, 84 percent of the adults had reactions to test number 7 (1/100,000 mg.) and 99.6 percent to test number 8 (1/10,000 mg.), whereas 93 percent of the children had reactions to the first of these two doses and 100 percent to the second.

In table 7 is shown the distribution, according to sex and race, of far advanced, moderately advanced, and minimal tuberculosis, respectively, in the 468 adults. While there were very few patients with minimal tuberculosis, no significant difference was found in their sensitivity to tuberculin in comparison with those who had either moderately or far advanced tuberculosis. Furthermore, there were

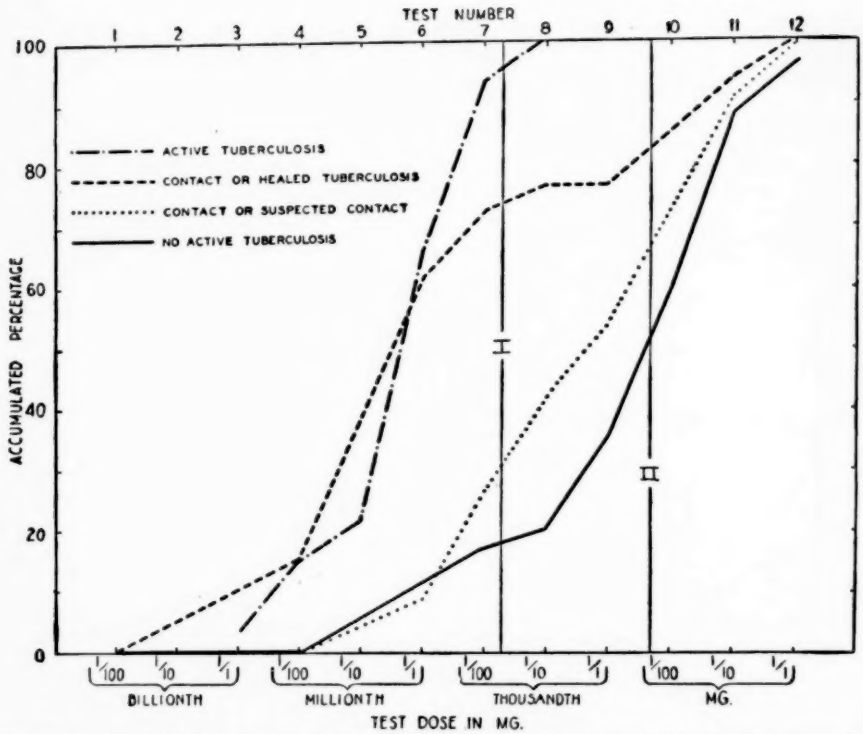

FIGURE 4.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 60 children with active tuberculosis, 46 children with healed or contact tuberculosis, 101 children contacts or suspected contacts, and 553 orphanage children with no apparent active tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

no differences in sensitivity to tuberculin when the data were analyzed from the standpoint of race, sex, and age of the patients. Progressive disease and fever appeared to cause a slight decrease in the sensitivity to tuberculin. The data on tuberculin sensitivity in cases of tuberculosis will be published later in more detail.

TABLE 6.—*Number and percentage of positive [1] reactors to various test doses of tuberculin PPD among 468 adult white and colored tuberculous patients of both sexes, aged 15–70 years*

Test No.	Tuberculin PPD, test dose in mg.	Number positive [1] reactors	Accumulatd number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)			
2	0.0000000001 (1/10 billionth)			
3	0.000000001 (1/1 billionth)	23	23	4.9
4	0.00000001 (1/100 millionth)	32	55	11.8
5	0.0000001 (1/10 millionth)	47	102	21.8
6	0.000001 (1/1 millionth)	148	250	53.4
7	0.00001 (1/100 thousandth)	142	392	83.8
8	0.0001 (1/10 thousandth)	74	466	99.6
9	0.001 (1/1 thousandth)	0	466	99.6
10	0.01 (1/100th)	2	468	100.0
11				
12				

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.

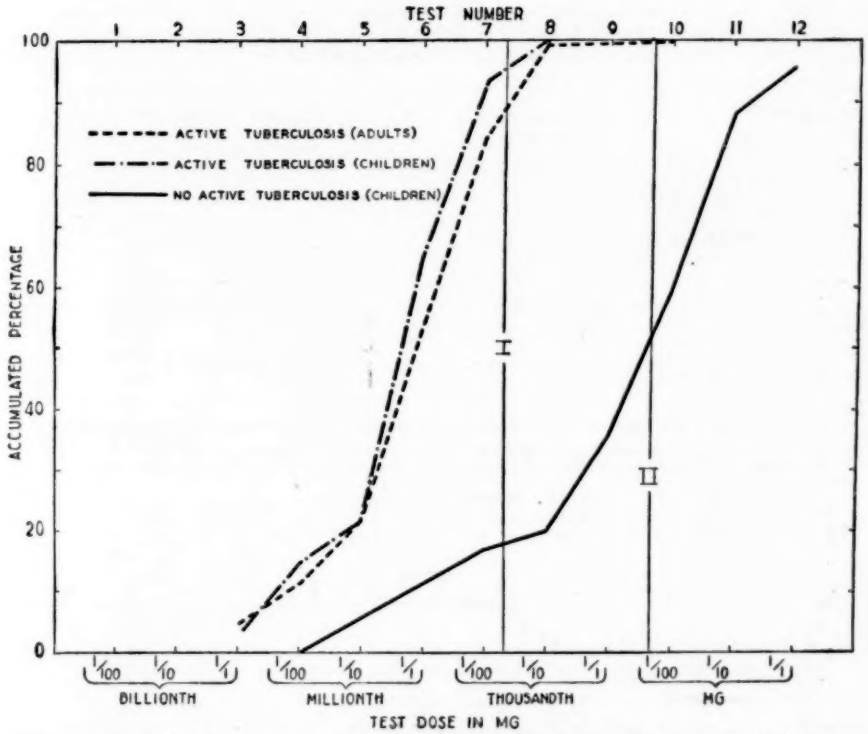

FIGURE 5.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 468 adults with active tuberculosis, 60 children with active tuberculosis, and 553 orphanage children with no apparent active tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

TABLE 7.—*Number and percentage distribution by race and sex of 468 adult cases of tuberculosis as to the type or stage of their tuberculosis*

Type or stage of tuberculous disease	White				Colored			
	Male		Female		Male		Female	
	Number of cases	Percent	Number of cases	Percent	Number of cases	Percent	Number of cases	Percent
All cases	175	100.0	136	100.0	84	100.0	73	100.0
Far advanced	154	88.0	88	64.7	61	72.6	50	68.5
Moderately advanced	13	7.4	35	25.7	11	13.1	10	13.7
Minimal	4	2.3	13	9.6	1	1.2	3	4.1
Pleurisy	4	2.3	----	----	4	4.8	10	13.7
Childhood type	----	----	----	----	1	1.2	----	----
Extra pulmonary only	----	----	----	----	6	7.1	----	----

The results of the testing of 499 patients in a hospital for the insane are shown in table 8 and figure 6. Shown also in the figure are the sensitivity curves for the adults with active tuberculosis (from fig. 5) and the children of the orphanage (from fig. 1). It is seen that this group of patients is not as sensitive to tuberculin as are active cases of tuberculosis but is far more sensitive than the children in the orphanage, none of whom had active tuberculosis.

TABLE 8.—*Number and percent of positive [1] reactors to various test doses of tuberculin PPD among 499 white and colored male adults aged 15–60 years in a mental hospital where the incidence of active tuberculosis was very high*

Test No.	Tuberculin PPD, test dose in mg.	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)			
2	0.000000001(1/10 billionth)			
3	0.00000001(1/1 billionth)	0	0	0
4	0.0000001(1/100 millionth)			
5	0.000001(1/10 millionth)	23	23	4.6
6	0.00001(1/1 millionth)			
7	0.0001(1/100 thousandth)	357	380	76.2
8	0.001(1/10 thousandth)	97	477	95.6
9	0.01(1/1 thousandth)	8	485	97.2
10	0.1(1/100th)	[4] 3	488	98.2
11	1.0(1/10th)	[4] 3	491	98.8
12	10.0(1 mg.)	[4] 4	[5] 495	99.6

(Tests 10, 11, and 12 are based on 497 individuals instead of 499 owing to the fact that two were not tested.

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.

[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.

[3] Using as 100 percent the total number of individuals tested.

[4] Two cases were not tested with tests 10, 11, and 12.

[5] In addition there were 2 cases which were negative to all tests.

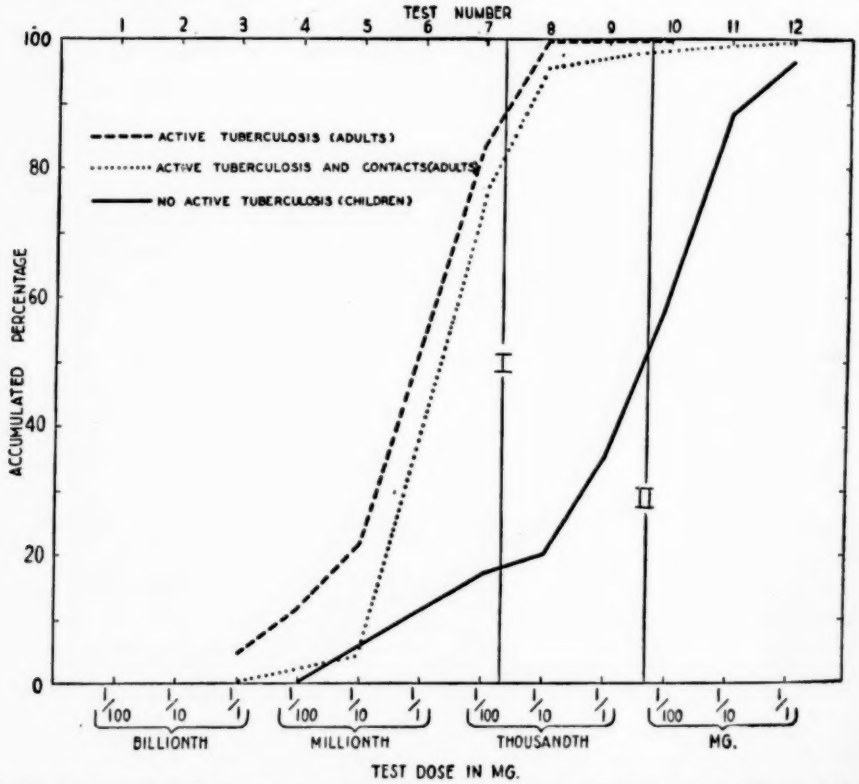

FIGURE 6.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 468 adults with active tuberculosis, 499 adults in a mental hospital (with a high incidence of active tuberculosis), and 553 orphanage children with no apparent active tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

DISCUSSION

It is evident from the data presented that the quantitative titration of tuberculin sensitivity by the use of doses of different concentration yields information which throws considerable light on the interpretation of the reaction. When the tuberculin sensitivity of each individual making up a population group is known, it is possible to construct a curve of tuberculin sensitivity for the group. When the same tuberculin solution and testing technique are used throughout, it is possible to compare the curves of tuberculin sensitivity of various population groups. In view of the known variations in the potency of different tuberculin products it must, however, be emphasized that the results in this study apply only to the single lot of PPD employed (number 98970). While it is probable that the general pattern of the sensitivity curves for any particular group would be quite similar for different lots or for different types of tuberculin, the responses at specific dosage levels might vary considerably. For this reason in recording skin reactions to tuberculin it is important to specify the type as well as the dose of tuberculin injected.

In figure 7 are presented the sensitivity curves of all the population groups tested. It is apparent that (1) almost all persons tested react to tuberculin if large enough doses are injected, and (2) that certain persons react to very small doses of tuberculin. In the main, those who reacted only to large doses of tuberculin were those who had no known contact with the tubercle bacillus. Conversely, the majority of those who reacted to the very small doses either had tuberculosis or had a history of contact with it.

Thus, the members of those groups in which there was no known contact with the tubercle bacillus (lines 4, 5, 6, and 3) are relatively insensitive to tuberculin, that is, large doses of tuberculin were required before there were any reactions. In addition, age seems to play a part in the reactions of those persons with no known contact. Evidence of the increasing sensitivity with age is reflected by the fact that the steep rise in the sensitivity curves does not begin until after test number 10 (1/100 mg.) for the youngest children (line 4) while it begins after test number 8 (1/10,000 mg.) for the older noncontact children (line 3). Of course, as age increases so does the possibility of unknown contact with the tubercle bacillus.

The sensitivity curves of those groups, all of whose members had a history of contact or actual tuberculous disease, differed markedly from the foregoing, owing primarily to a greater percentage of reactors to the smaller test doses. These differences may be illustrated by comparing the percentage of persons who react to test number 8 (1/10,000 mg.) among the various groups. In the following

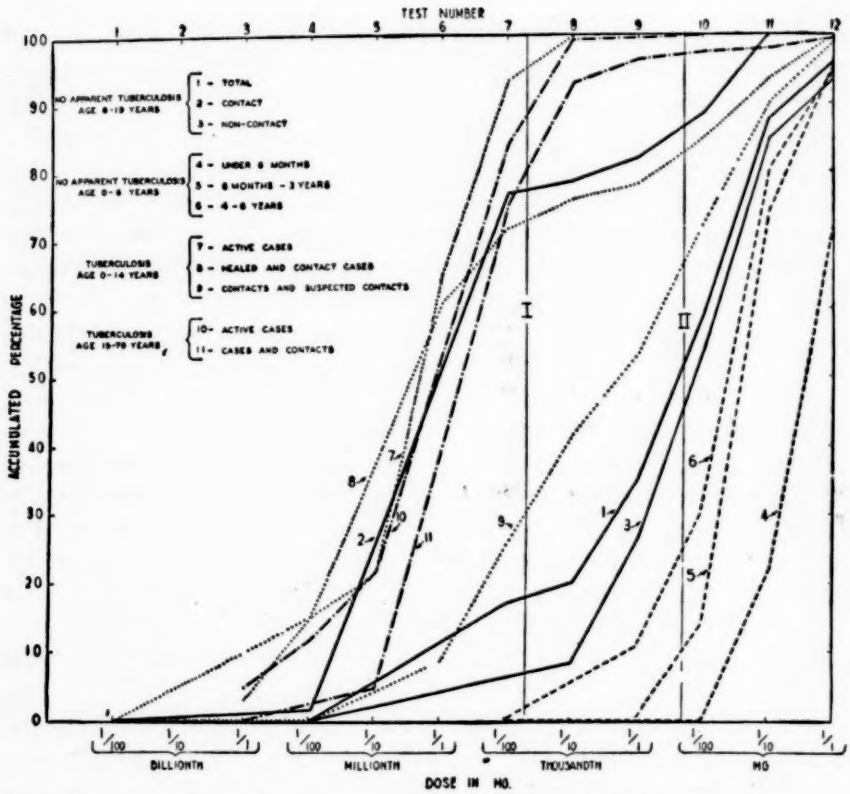

FIGURE 7.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among different population groups with different degrees of contact with tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

table the proportion reacting to this test among the various groups is shown in descending order.

Group	Line number in figure 7	Percentage positive to test number 8	Proportion of group who had contact with tubercle bacillus and type of contact
Tuberculous children	7	100	All (active tuberculosis).
Tuberculous adults	10	99	Do.
Mentally ill patients	11	96	Presumably all (10 percent have active tuberculosis and remainder are in intimate contact with them).
Orphanage "contacts," or children with history of contact with tuberculosis.	2	79	Presumably all (history of family contact).
Preventorium	8	76	Presumably all (history of previous infection or of contact).

It is evident from a study of the table that this arrangement in descending order of tuberculin sensitivity also arranges the groups by the certainty of tuberculous infection. Thus the greatest percentage of reactors is found among the tuberculous cases, who are obviously the most certainly infected. Somewhat fewer reactors are found

among the patients in the hospital for the insane, 10 percent of whom were active cases and the remainder in close contact with them and probably infected. Among the two groups, all the members of which were contacts by history only, it is seen that 79 and 76 percent reacted. This finding, that all persons with a history of contact do not react to low doses of tuberculin, is in agreement with the findings of others (*5*). Three possible explanations of this failure of persons with a history of contact to react to small doses of tuberculin must be considered: (1) That these persons had been infected with the tubercle bacillus and had either not become hypersensitive, or having once been hypersensitive to tuberculin, had subsequently become anergic; (2) that, although they had lived in homes or institutions where there was open tuberculosis, they had not been infected; or (3) that the history of tuberculous contact was incorrect. Obviously, history of contact with tuberculosis is not always reliable, and there are reasons to assume that reactions to small doses of tuberculin are a more adequate measure of tuberculous infection than merely history of contact. On the basis of such an assumption it would be interpreted that the 8.5 percent of the noncontact group (line 3, fig. 7), who had positive reactions to test number 8 had had effective contact (or infection) with the tubercle bacillus, and, on the same basis, that the 21 percent of the contact group (line 2, fig. 7) who had no reaction to test number 8 probably had not had effective contact (or been infected) with the tubercle bacillus.

The two remaining curves (lines 9 and 1, fig. 7) represent groups part of whom had a history of contact and part of whom did not. They thus might be considered to be made up of different proportions of persons from the hypersensitive (or infected) group and the insensitive (or noninfected) group. Their sensitivity curve would then be intermediate between the two extremes of sensitive and insensitive, tending to resemble more those groups from which a majority of their members were drawn. Thus the children of the total orphanage group, of whom 20 percent had a history of contact with tuberculosis, had 20 percent of reactors to test number 8 (1/10,000 mg.) while the children of the antituberculosis camp, 60 percent of whom had a history of contact, had 42 percent reactors to this test dose.

The exact significance of skin reactions which are obtained only to large doses of tuberculin is not clear. There are reasons, however, which make it appear likely that these reactions are nonspecific or, in other words, that they are not due to infection with the tubercle bacillus. In the first place, since almost everyone reacted, if these reactions were specific it would be necessary to assume that almost all persons tested, even very young infants, had been infected with the tubercle bacillus. Such an assumption seems unwarranted. In the second place, the character of the reaction to the larger doses of tuber-

culin was different from that to the smaller doses. This statement is made without further elaboration since these differences will be described in detail in a subsequent publication. In the third place, reactions to the larger doses of tuberculin were much less stable over a period of time than were reactions to the smaller doses. This finding (to be reported in detail later) is supported by the work of Dahlstrom (*6*) who reports that 60 percent of reactors to the usual second testing dose of tuberculin reverted from positive to negative over a period of years compared to less than 4 percent of the reactors to the usual first testing dose.

If the assumption is correct that reactions occurring with large doses of tuberculin are not specific, then it becomes important to determine if possible at what dose of tuberculin the nonspecific character becomes evident. It would appear likely that the nonspecific effect, if such occurs, must not become evident at any one dose but must be manifest to a number of doses. This hypothesis is supported by the fact that the sharp upward trend of the curves suggestive of nonspecificity does not begin at the same dosage level in all of the noncontact groups. However, the fact that the nonspecificity increases as the dosage of tuberculin is increased is an added argument for limiting the dosage of tuberculin to an amount not greater than 1/10,000 mg. (test number 8), at which dosage level the element of nonspecificity, if it does occur, does not appear to be of great significance.

It is necessary to consider the possibility that the children who received multiple injections of tuberculin but who had skin reactions only to the larger doses of tuberculin (tests 11 and 12) may have been sensitized by the tuberculin injected in the preceding tests (*9*). Several experimental procedures were carried out to test this possibility. In no instance was there evidence to suggest that sensitivity to tuberculin had been induced by the injection of tuberculin. The details of this portion of the study will be reported separately.

From these observations it appears that most persons with tuberculosis react to a relatively small dose of tuberculin (about $\frac{1}{10000}$ mg. of the PPD used in this study). In our experience with over 500 cases of tuberculosis more than 99 percent reacted to this dose, which is five times more concentrated than the usual first testing dose of PPD. Similar findings are reported by Long (*7*) on 609 cases of tuberculosis from the Phipps Clinic; 94 percent of the white and 96 percent of the colored reacted to the first testing strength of OT or PPD. A large proportion of persons in intimate contact with active tuberculosis will also react to this dose. If larger doses are used it should be with the realization that they may invoke what are probably "nonspecific" reactions, and that such reactions occur with increasing frequency as the dosage is increased.

SUMMARY

1. A quantitative method of titrating sensitivity to tuberculin is presented.

2. This method was applied to various population groups and the resultant "curves of sensitivity" to tuberculin are compared.

3. It is demonstrated that contact with the tubercle bacillus markedly increases sensitivity to tuberculin in most cases.

4. The tuberculin sensitivity of patients suffering from active tuberculosis is so extreme that these persons may be detected by the use of small doses of tuberculin, in the neighborhood of 1/10,000 of a milligram, of the particular PPD employed in this study.

5. It is demonstrated that almost all persons tested will react if sufficiently large doses of tuberculin are given.

6. Patients with active tuberculosis, both adults and children, who are anergic to tuberculin were not encountered in this study. Slight depression of tuberculin sensitivity occurred in only 2 out of 528 cases.

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MORBIDITY AND MORTALITY DURING 1940 AND RECENT PRECEDING YEARS

MORBIDITY

The following data concerning the prevalence of eight communicable diseases are based on reports submitted by the health officers of the several States and the District of Columbia (table 1). Although cases of each of these diseases are reportable by law, there is considerable variability in the completeness of the reports. The number of cases reported is somewhat smaller than the number of cases which occurs during any given year, but it is believed that the reports are sufficiently accurate to reveal any unusual prevalence arising from an epidemic.

Diseases above the median prevalence.—The numbers of reported cases of influenza and poliomyelitis in 1940 were 57 percent and 33 percent greater, respectively, than the corresponding median numbers for the 5-year period 1935–39. The minor epidemic of influenza which occurred during the first few weeks of 1940 began during the latter part of November 1939 in the Southern States and in the Mountain States of the West. Unlike the outbreaks of recent years the peak was reached relatively early in the winter, around the first of February 1940, after which the number of cases decreased rapidly (fig. 1).

TABLE 1.—*Number of reported cases of certain communicable diseases in the United States in 1939 and 1940 and the median number of cases reported for 1935–39*

Disease	1940		1939		Median 1935–39	
	Cases	Number of States reporting	Cases	Number of States reporting	Cases	Number of States reporting
Diphtheria	15,515	48	24,053	48	30,018	48
Influenza [1]	426,851	42	271,771	42	271,771	42
Measles	290,474	48	403,317	48	403,317	48
Meningitis, meningococcus [2]	1,645	44	1,967	44	5,484	44
Poliomyelitis	9,795	48	7,343	48	7,343	48
Scarlet fever	155,443	48	162,897	48	228,887	48
Smallpox	2,795	48	9,877	48	9,877	48
Typhoid and paratyphoid fever	9,801	48	13,069	48	15,898	48

[1] New Hampshire, Massachusetts, New York, Pennsylvania, Michigan, and Colorado are omitted.
[2] New Hampshire, Vermont, South Carolina, and Nevada are omitted.

Figures for 1940 are preliminary.

A much more severe epidemic began in November 1940 in Arizona and California and rapidly spread eastward across the southern part of the country. The peak was reached during the latter part of January 1941, with the number of cases more than 6 times the corresponding number reported at the peak in February 1940. During the entire year the prevalence of influenza was relatively low in the Northeastern and North Central States.

The number of cases of poliomyelitis reported during 1940 was the largest since 1935 (fig. 2). This disease was unusually prevalent throughout the North Central States and to a lesser extent in the

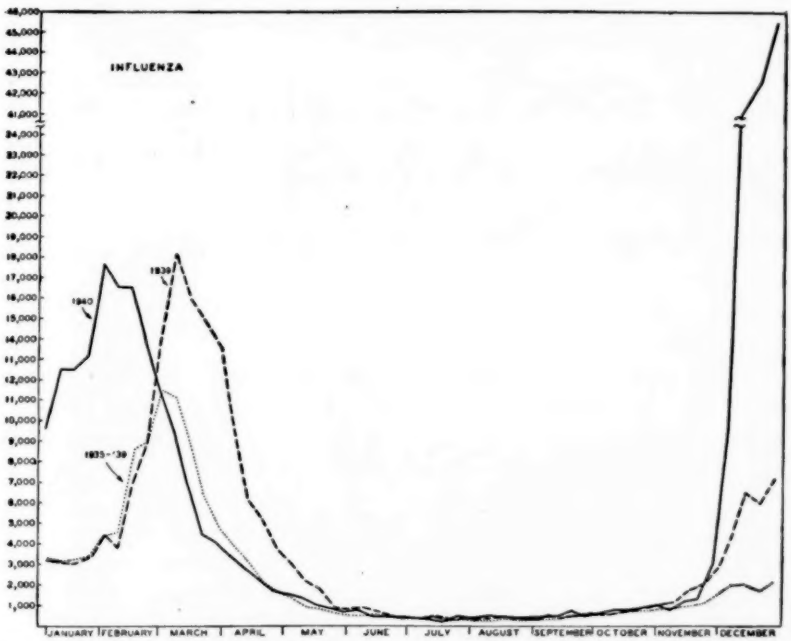

FIGURE 1.—Number of reported cases of influenza by weeks for 1940, 1939, and the median number for 1935–39.

Pacific Coast States. The New England and Middle Atlantic States reported relatively few cases of poliomyelitis during 1940.

Diseases below the median prevalence.—The numbers of reported cases of diphtheria, smallpox, and typhoid fever for 1940 were the lowest on record (figs. 3, 4, 5). The number of cases of diphtheria was only about one-half the median number for 1935–39. The decline in the number of reported cases of smallpox was even greater, the number of cases for 1940 being only 28 percent of the preceding 5-year median. As usual, the prevalence was relatively highest in the West North Central, and Mountain States. In contrast, no cases were reported from the New England and Middle Atlantic States.

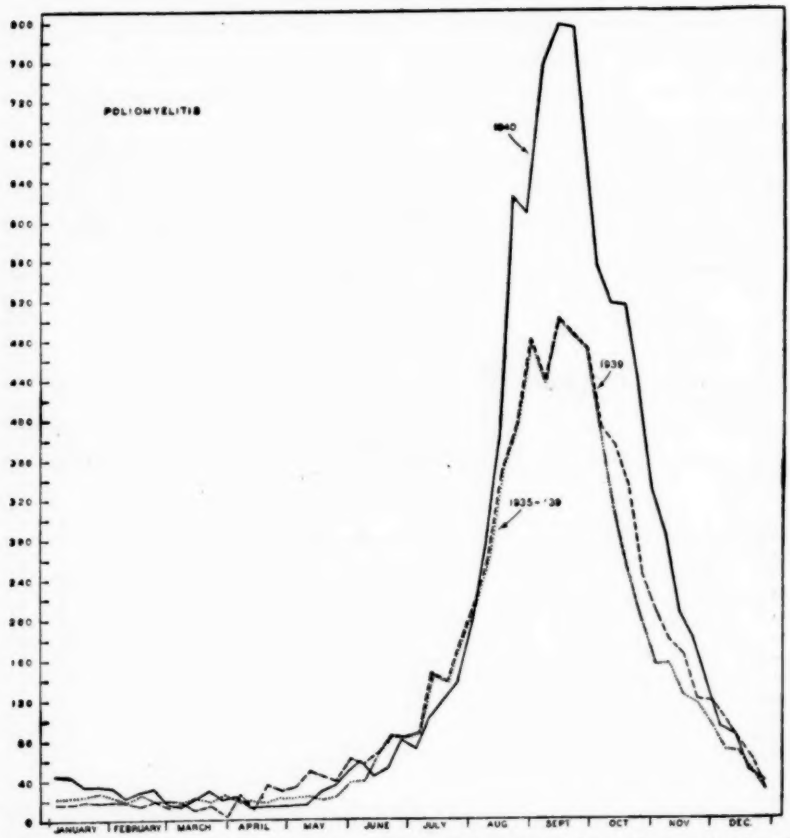

FIGURE 2.—Number of reported cases of poliomyelitis for 1940, 1939, and the median number for 1935–39

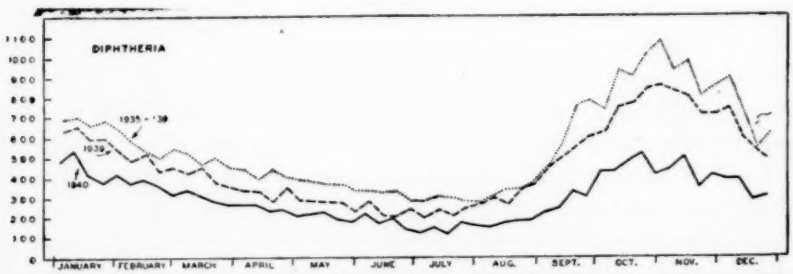

FIGURE 3.—Number of reported cases of diphtheria by weeks for 1940, 1939, and the median number for 1935–39.

Even though the number of cases of smallpox in 1940 was the lowest on record it is still unnecessarily large for a disease which can be practically eliminated by well-known methods of control. The numbers of reported cases of measles, meningococcus meningitis, scarlet fever, and typhoid fever were all less than the numbers reported during 1939, as well as the median number for the 5-year period 1935–39.

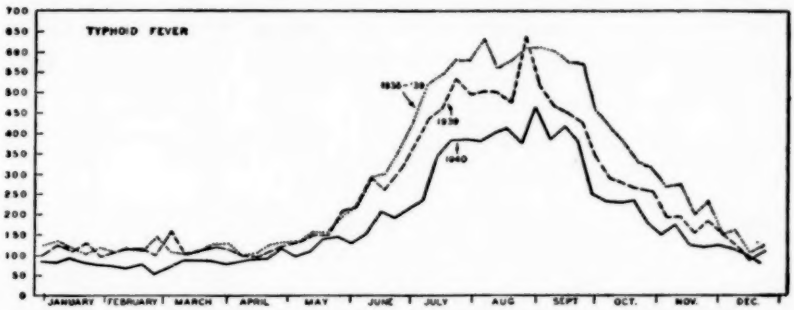

FIGURE 4.—Number of reported cases of typhoid fever by weeks for 1940, 1939, and the median number for 1935–39.

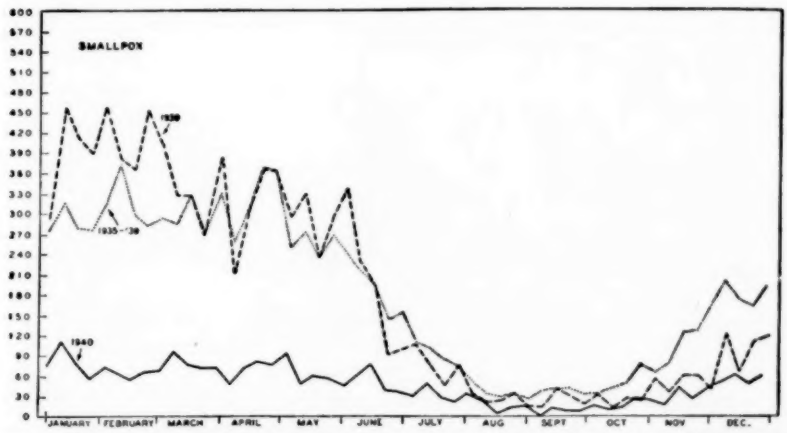

FIGURE 5.—Number of reported cases of smallpox by weeks for 1940, 1939, and the median number for 1935–39.

MORTALITY

The mortality rates in table 2 are based on preliminary data for 40 States and the District of Columbia. In addition, comparative mortality rates by quarters for the past 3 years are shown in table 3 for 38 States and the District of Columbia. Death rates for 1940 for 45 individual States, the District of Columbia, Alaska, and Hawaii are presented in tables 4 and 5.

This report is made possible through a cooperative arrangement with the respective States which voluntarily furnish provisional tabulations of current birth and death records to the United States Public

Health Service which provides for the publication of the data received. Because of lack of uniformity in the method of classifying deaths according to cause, and the impossibility of including a certain number of delayed certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.

Data for preceding years from the same source, collected and tabulated in the same way as the current data, are included for comparative purposes. The figures are used in preference to the final figures

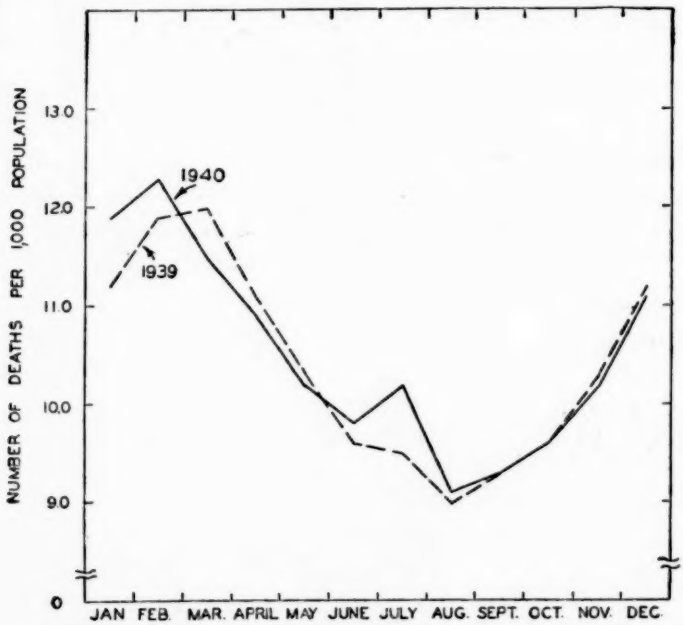

FIGURE 6.—Number of deaths per 1,000 estimated population by months for 1939 and 1940.

published by the Bureau of the Census because it is believed that they are more comparable with current provisional information.

In the past these preliminary reports have provided an early accurate index of the trend of mortality for the country as a whole. Some deviation from the final figures for individual States may be expected because of the provisional nature of the reports. It is believed, however, that the trend of mortality within each State is correctly represented. Comparisons of specific causes of death among the States are subject to some error because of differences in tabulation procedure and completeness of reporting. Comparisons of this nature should be made only from the final figures published by the Bureau of the Census.

Preliminary reports indicate that the death rate from all causes was about 1 percent higher in 1940 than in 1939, but since the rate in 1939 was the lowest reported in the history of the registration area the record for 1940 must be regarded as very favorable. One-half of the States for which comparable data are available reported a death rate as low or lower in 1940 than that for 1939.

Diseases with lower death rates.—A lower death rate in 1940 than in 1939 was reported for each of the acute diseases, which are shown separately in table 2, except poliomyelitis and acute infectious encephalitis, each of which is relatively unimportant as a cause of death. Especially noteworthy is the low mortality rate for influenza and pneumonia in spite of the minor epidemic of influenza during the first part of the year and the more severe epidemic which started during the latter part of November. The relative number of fatal pneumonia cases has rapidly declined since the discovery and use of serum and chemotherapy, the death rate during 1940 being only 58 percent of that for 1936. Only 6 of the 41 States for which data are available reported a higher rate in 1940 than in 1939.

The four principal communicable diseases of early childhood—diphtheria, measles, scarlet fever, and whooping cough—were responsible for about 25 percent fewer deaths in 1940 than in the previous year. Although the mortality rate from these diseases is now very low, a continued decline in the rate is very gratifying.

Thirty-one of the 41 States reported a lower mortality from tuberculosis than in 1939. The death rate for the entire group of States has declined 18 percent since 1936.

The maternal mortality rate declined for the eleventh consecutive year. Only 15 of the 41 States reported an increase in the rate over 1939; for the entire group the rate during 1940 was only about two-thirds of that for 1936.

Other diseases causing a lower mortality in 1940 than in 1939 were typhoid fever, malaria, pellagra, digestive disorders, and diarrhea and enteritis.

Diseases with higher death rates.—Poliomyelitis and encephalitis were the only acute diseases which caused relatively more deaths in 1940 than in 1939. Except for the second quarter of the year, fatal cases of poliomyelitis were more numerous than during the corresponding period of the previous years. However, most of the increase resulted from the minor epidemic which occurred during the latter half of the year.

The gain during the 2 previous years in lowering the death rate from automobile accidents was completely wiped out in 1940. At the same time the relative number of other fatal accidents also increased. These increases, in part at least, reflect increased industrial activity

and improved economic conditions. Thirty-three of the 41 States reported more fatal automobile accidents than in 1939.

The important chronic diseases of late adult life and old age—cancer, cerebral hemorrhage, diabetes, heart disease, and nephritis—accounted for a larger proportion of the total number of deaths in 1940 than in the previous year.

BIRTH RATE AND INFANT MORTALITY RATE

Only 10 States reported an increased infant mortality rate. Although the amount of decrease for the entire group of States was less than that for recent years the rate for 1940 was 16 percent less than the rate for 1936.

There was a widespread increase in the birth rate during 1940. Thirty-three of the 38 reporting States had a higher rate than in 1939. As a result, the crude rate of natural increase for 1940 was 6.8 per 1,000 population as compared with 6.4 per 1,000 population for 1939.

TABLE 2.—*Summary of mortality trends from certain causes in a group of 41 States, 1936–40* [1] *(estimated population July 1, 1940, 112,590,000)*

[Rates provisional for all years]

Diseases (numbers in parentheses are from the International List of Causes of Death, revised February 1940 for 1938 International List)	1940	1939	1938	1937	1936
	Rate per 1,000 population				
Deaths, all causes	10.5	10.4	10.4	11.0	11.4
Births, exclusive of stillbirths	17.6	17.1	17.6	17.1	16.8
	Rate per 1,000 live births				
Infant mortality (live births, 1940, 1,977,591)	47	48	50	54	56
Maternal mortality	3.6	3.8	4.2	4.7	5.5
	Rate per 100,000 population				
Typhoid and paratyphoid fever (1, 2)	1.0	1.5	1.8	2.0	2.3
Cerebrospinal (meningococcus) meningitis (6)	.5	.5	.7	1.6	2.3
Scarlet fever (8)	.5	.7	.9	1.4	2.0
Whooping cough (9)	2.1	2.3	3.5	3.6	2.1
Diphtheria (19)	1.0	1.5	1.9	2.0	2.3
Tuberculosis, all forms (13–22)	43.8	45.0	47.0	51.3	53.3
Malaria (23)	.8	1.0	1.5	1.8	2.8
Influenza (grippe) (33)	14.8	16.4	12.4	29.1	25.2
Measles (35)	.5	.9	2.3	1.0	.8
Acute poliomyelitis and acute polioencephalitis (36)	.7	.5	.4	1.0	.5
Acute infectious encephalitis (lethargic) (37)	.5	.4	.5	.6	.6
Cancer and other malignant tumors (45–55)	117.8	114.4	113.0	108.1	109.5
Diabetes mellitus (61)	26.4	25.4	23.8	23.7	23.9
Pellagra (except alcoholic) (69)	1.4	1.7	2.3	2.4	3.2
Cerebral hemorrhage, embolism, and thrombosis (83a, b)	89.5	85.7	83.4	84.4	88.4
Diseases of the heart (90–95)	288.9	276.2	266.7	238.8	261.6
Pneumonia, all forms (107–109)	53.5	58.5	66.4	84.2	92.1
Diseases of the digestive system (115–129)	56.3	58.6	61.9	64.7	68.5
Diarrhea and enteritis under 2 years (119)	7.1	8.0	10.3	10.6	11.4
Nephritis, all forms (130–132)	76.4	72.2	75.0	77.5	81.6
All accidents, including automobile accidents (169–195)	70.3	68.5	69.6	78.9	83.9
Automobile accidents only (170 a, b, c)	24.3	22.7	23.1	28.4	28.3

[1] The States included are all of those except Alabama and Washington listed in tables 4 and 5 that have data for the 5 years included. The District of Columbia is counted as a State.

TABLE 3.—*Trends of mortality from certain causes in each quarter of 1940, 1939, and 1938 in the 39* [1] *States with available data (estimated population July 1, 1940, 103,971,900)*

TABLE 3.—*Trends of mortality from certain causes in each quarter of 1940, 1939, and 1938 in the 39 [1] States with available data (estimated population July 1, 1940, 103,971,900)*

[Rates provisional for all years]

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																
			Total infant mortality	Maternal mortality	Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and policencephalitis (36)	Acute infections encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis, under 2 years (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
January-December:																								
1940	10.6	17.4	45	3.5	0.9	0.5	0.5	1.9	0.9	43.0	13.6	0.3	0.7	0.5	121.3	27.5	91.6	208.5	53.8	54.8	5.6	77.0	70.4	24.3
1939	10.5	16.9	46	3.7	1.3	.5	.7	2.1	1.4	44.1	15.7	.8	.5	.4	118.4	26.5	87.6	245.6	58.9	58.3	6.8	73.0	69.1	22.7
1938	10.5	17.4	49	4.1	1.5	.7	1.0	3.3	1.7	45.7	11.3	2.3	.3	.6	116.5	24.8	84.6	270.9	65.2	61.8	9.3	75.7	69.6	22.9
January-March:																								
1940	12.0	16.1	52	4.0	.5	.7	.9	1.7	1.2	45.1	31.9	.4	.3	.5	122.1	32.4	103.2	342.9	86.3	53.3	4.2	88.0	66.5	19.2
1939	11.9	16.3	54	4.1	.8	.7	1.2	2.5	1.6	46.0	33.5	1.4	.1	.5	118.4	30.5	95.7	326.1	105.4	55.0	4.1	83.8	62.4	18.1
1938	11.3	16.6	52	4.4	.7	1.1	1.6	3.4	1.8	47.5	21.3	4.0	.3	.8	115.1	27.1	90.3	292.2	103.0	55.2	4.1	82.0	63.1	19.6
April-June:																								
1940	10.4	17.0	44	3.8	.6	.5	.5	1.8	.6	46.0	10.2	.5	.2	.6	119.9	26.4	90.4	298.2	47.6	52.7	3.1	77.9	65.4	21.2
1939	10.4	16.5	46	3.9	.8	.5	.7	2.3	.7	47.4	16.3	1.2	.3	.4	118.0	26.2	86.5	281.9	51.9	57.4	5.8	74.6	65.7	19.0
1938	10.4	17.0	50	4.3	1.1	.7	1.0	4.0	1.0	48.9	8.4	4.3	.3	.5	115.9	24.5	83.7	268.6	60.1	64.3	9.7	77.4	63.6	19.2
July-September:																								
1940	9.6	18.5	39	3.3	1.5	.3	.3	1.9	.6	41.2	3.1	.2	1.5	.6	121.4	23.8	82.7	258.1	28.4	60.7	8.8	68.1	75.7	25.7
1939	9.3	17.8	40	3.5	2.3	.4	.3	2.0	.9	41.2	3.3	.2	.9	.5	116.4	22.4	75.7	241.4	26.7	64.8	11.0	62.8	72.4	23.9
1938	9.6	18.2	46	3.9	2.5	.5	.5	3.5	1.2	44.0	4.1	.7	.4	.7	115.9	21.8	76.2	237.5	33.5	70.3	15.8	67.7	77.0	24.4
October-December:																								
1940	10.5	18.0	46	2.9	.8	.4	.4	2.3	1.3	39.8	9.6	.1	1.1	.5	122.0	27.3	90.1	295.3	53.1	52.6	6.3	74.1	74.0	30.9
1939	10.5	17.2	45	3.4	1.2	.4	.6	1.6	2.4	42.0	10.3	.2	.7	.4	120.8	26.9	90.6	293.7	52.5	55.9	6.3	71.1	75.8	29.9
1938	10.7	17.7	48	3.7	1.5	.6	.9	2.4	2.8	42.5	11.5	.4	.3	.5	119.0	25.8	88.5	285.8	60.1	57.2	7.5	75.6	74.4	28.3

See footnotes at end of table.

TABLE 3.—*Trends of mortality from certain causes in each quarter of 1940, 1939, and 1938 in the 39 States with available data (estimated population July 1, 1940, 103,971,900)*—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																	
			Total infant mortality	Maternal mortality	Typhoid fever (1–2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13–22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45–55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis, under 2 years (119)	Nephritis, all forms (130–132)	All accidents, including automobile accidents (169–195)	Automobile accidents (170a, b, c)
Metropolitan Life Insurance Co., industrial policyholders (January–December): [2]																						
1940	7.6	------	------	------	0.7	------	0.6	1.2	0.8	44.3	7.9	0.3	------	------	103.5	29.5	60.8	[3]158.6	35.5	------	2.9	[4]56.6	46.7	[5]17.0
1939	7.6	------	------	------	.7	------	.7	1.6	1.3	45.2	9.9	.6	------	------	101.7	27.7	59.7	[3]161.0	42.8	------	3.7	[4]51.8	46.2	[5]17.3
1938	7.7	------	------	------	1.0	------	1.1	2.0	1.7	47.2	7.5	1.6	------	------	98.8	24.8	58.5	[3]154.0	50.6	------	5.3	[4]53.8	48.4	[5]17.6

[1] The States included are all of those except Alabama, Mississippi, Texas, and Washington listed in tables 4 and 5 that have data for the 3 years included. The District of Columbia is counted as a State.

[2] These data are taken from the Monthly Statistical Bulletin published by the Metropolitan Life Insurance Co. The figures are subject to correction, since they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.

[3] Excludes pericarditis, acute endocarditis, and acute myocarditis.

[4] Chronic nephritis only.

[5] Excludes collisions between automobiles and railroad trains or street cars.

TABLE 4.—*Trend of death rates from all causes, of birth rates, and of infant and maternal mortality rates, 1936–40*

TABLE 4.—*Trend of death rates from all causes, of birth rates, and of infant and maternal mortality rates, 1936–40*

[Rates provisional for all years]

State	Deaths, all causes (rate per 1,000 population)					Births, exclusive of stillbirths (rate per 1,000 population)					Infant mortality (rate per 1,000 live births)					Maternal mortality (rate per 1,000 live births)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	10.2	10.2	10.7	11.2	11.3	22.3	22.3	22.5	22.2	22.1	62	60	61	63	66	6.1	5.8	6.2	5.9	6.7
California	(1)	11.3	11.4	12.2	11.8	(1)	15.2	14.5	14.3	13.1	(1)	42	46	54	53	(1)	3.0	3.5	4.2	4.7
Colorado	11.1	11.2	11.4	12.7	12.8	18.9	18.3	18.3	18.3	17.1	69	53	59	70	74	4.4	5.1	4.3	5.5	7.1
Connecticut	9.5	10.0	10.3	10.5	10.5	11.8	12.5	13.8	13.3	12.9	38	38	36	41	43	3.5	2.9	2.7	2.9	4.5
Delaware	12.1	11.8	12.0	13.9	13.0	16.5	16.3	16.7	16.6	15.3	51	44	51	66	65	5.0	4.7	5.7	4.4	7.1
District of Columbia	13.0	12.7	12.6	14.2	15.2	22.8	21.5	20.6	20.0	19.7	47	47	48	61	72	2.8	4.7	5.4	5.3	6.0
Florida	11.9	11.4	11.6	12.6	12.8	17.2	17.0	16.9	17.7	17.1	54	57	58	60	59	6.3	6.4	7.3	6.8	8.1
Georgia	10.0	9.7	10.5	10.9	11.9	20.2	19.9	20.2	20.1	19.6	58	59	68	63	70	5.2	5.5	6.6	7.4	7.9
Idaho	9.3	9.2	9.0	9.6	10.6	22.4	21.9	22.3	21.2	20.9	41	45	45	45	50	3.2	2.5	3.7	3.9	3.2
Illinois	11.2	11.0	10.8	11.2	11.9	15.6	15.0	15.5	14.8	14.4	35	38	41	43	47	2.9	3.0	3.3	3.8	4.2
Indiana	11.3	11.1	10.9	11.6	12.1	16.9	15.6	16.2	15.0	14.6	39	41	45	52	53	2.7	3.9	3.3	3.7	4.7
Iowa	9.8	9.9	9.6	9.9	10.0	17.9	17.0	17.1	16.7	16.9	34	39	38	41	42	3.1	2.6	3.1	4.0	4.2
Kansas	10.2	10.3	10.2	10.5	11.8	15.9	16.0	16.3	16.0	16.6	34	39	43	45	51	3.6	3.4	4.0	4.1	5.1
Kentucky	10.3	10.4	9.8	10.8	11.2	21.7	20.8	24.6	22.1	19.3	46	54	49	50	67	3.8	4.4	3.8	3.8	5.6
Louisiana	10.9	10.4	10.6	10.9	11.3	21.0	20.5	20.6	19.5	18.2	65	61	66	64	74	5.3	6.0	6.0	7.5	9.4
Maine	12.4	12.8	12.3	13.6	13.7	17.5	17.6	18.2	18.6	18.5	54	51	49	61	64	4.2	4.2	4.2	5.4	5.1
Maryland	12.1	11.5	11.7	12.5	12.6	16.7	15.7	16.4	15.6	15.3	43	50	55	62	68	2.7	3.3	3.4	4.1	4.3
Massachusetts	11.8	11.6	11.2	11.6	11.8	(1)	14.7	13.8	13.9	13.9	(1)	39	40	44	47	(1)	3.5	3.9	4.6	4.9
Michigan	9.9	10.1	10.0	10.8	11.3	18.8	18.3	19.1	18.5	18.3	41	42	45	48	50	2.9	2.9	3.5	3.6	4.7
Minnesota	9.5	9.5	9.4	9.7	10.4	18.5	17.6	17.1	17.1	16.5	33	36	40	41	46	2.3	2.5	2.8	3.1	4.4
Mississippi	10.0	10.0	10.6	11.3	10.5	(1)	23.8	26.5	25.8	24.6	(1)	56	57	59	58	(1)	5.9	5.9	7.1	6.9
Missouri	(1)	11.5	11.4	12.2	13.1	(1)	17.2	16.8	15.3	15.0	(1)	43	48	58	58	(1)	3.4	3.6	5.2	6.1
Montana	10.2	10.6	10.2	10.9	11.3	20.4	19.4	19.2	18.5	18.8	46	50	43	49	53	3.5	3.2	3.7	3.4	5.5
Nebraska	9.5	9.1	9.0	9.8	10.1	16.5	16.5	16.5	16.3	17.3	36	34	36	42	44	3.2	3.4	3.4	3.9	5.6
Nevada	11.9	11.3	11.7	12.2	14.0	18.6	17.3	17.2	15.2	13.8	50	44	45	44	70	4.9	4.2	1.6	6.9	5.6
New Jersey	10.8	10.5	10.5	10.7	10.9	14.1	13.6	13.6	13.2	13.0	36	38	39	39	38	2.8	2.9	3.5	3.4	3.8
New Mexico	10.5	10.9	11.0	12.8	12.7	29.8	30.0	29.0	27.6	26.3	93	96	99	124	122	4.4	4.3	4.6	5.0	7.4
New York	11.1	11.1	11.0	11.6	11.6	14.6	14.1	14.2	14.0	13.7	37	39	40	45	47	2.9	3.0	3.8	3.9	4.9
North Carolina	9.0	9.0	9.7	9.9	10.5	23.0	22.7	23.0	23.3	22.5	56	58	68	65	67	5.3	4.8	5.6	5.4	6.5
North Dakota	7.9	8.4	7.9	8.6	8.6	20.9	20.8	20.2	20.0	20.7	41	48	48	53	50	1.6	2.3	2.2	4.8	4.3
Ohio	11.3	11.2	10.9	11.7	11.9	16.3	15.6	16.4	15.6	15.1	39	45	42	50	51	3.3	3.6	3.7	4.6	4.9
Oklahoma	8.7	8.9	8.5	9.2	9.9	19.0	18.8	19.2	17.6	17.7	50	52	43	59	60	3.5	4.2	4.0	6.9	6.2
Oregon	(1)	10.9	11.0	11.7	11.9	(1)	15.3	15.3	14.7	13.5	(1)	35	38	42	44	(1)	2.4	3.1	3.5	5.4
Pennsylvania	10.9	10.7	10.8	11.5	11.4	16.3	16.3	16.8	16.4	16.2	44	44	46	50	50	2.5	3.2	3.5	4.0	4.6
Rhode Island	11.2	11.0	11.8	12.0	12.2	15.1	14.7	15.0	14.7	14.8	38	40	44	50	49	2.4	3.2	2.5	3.4	4.1
South Carolina	10.6	10.0	10.9	10.8	11.4	22.7	21.7	21.3	20.5	21.2	70	68	81	81	80	6.3	5.9	7.7	7.8	7.9
South Dakota	8.7	8.9	7.4	9.3	9.2	19.0	18.0	18.0	17.6	19.2	39	41	45	52	48	3.7	3.0	3.5	4.2	4.1
Tennessee	10.0	9.7	10.0	10.5	11.4	18.2	17.6	17.9	18.0	17.4	55	54	64	60	68	4.8	5.5	5.6	6.2	7.0

See footnote at end of table.

TABLE 4.—*Trend of death rates from all causes, of birth rates, and of infant and maternal mortality rates, 1936–40*—Continued

[Rates provisional for all years]

State	Deaths, all causes (rate per 1,000 population)					Births, exclusive of stillbirths (rate per 1,000 population)					Infant mortality (rate per 1,000 live births)					Maternal mortality (rate per 1,000 live births)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Texas	9.3	8.7	9.6	10.5	10.6	(1)	17.9	19.2	18.6	18.0	(1)	62	65	74	71	(1)	4.7	5.6	5.7	6.9
Utah	8.9	8.5	8.8	9.1	9.6	24.4	23.1	24.3	23.1	23.5	40	37	45	41	53	2.4	2.8	3.2	3.3	4.4
Vermont	11.6	11.7	11.6	12.2	13.8	18.4	15.9	15.7	17.6	17.9	36	36	43	45	58	3.8	3.3	3.0	4.9	5.0
Virginia	11.0	10.7	10.9	11.1	11.7	20.1	19.4	19.8	19.4	19.7	60	62	69	64	67	4.4	4.9	5.1	5.0	5.1
Washington	11.4	10.8	10.8	11.3	11.5	16.1	14.9	15.4	14.6	13.7	35	38	39	39	46	3.2	3.8	3.6	4.8	5.2
West Virginia	9.2	9.3	9.5	10.4	10.8	22.1	22.0	22.7	22.7	22.2	54	55	62	62	71	3.6	3.5	3.6	4.9	5.3
Wisconsin	10.0	9.9	9.8	10.4	10.8	17.3	17.2	17.4	17.0	16.8	37	40	42	44	47	2.6	2.8	2.9	3.5	4.0
Wyoming	8.5	8.9	9.0	10.2	9.9	19.9	19.7	19.5	18.9	19.7	47	45	53	53	58	4.4	3.5	3.5	3.5	5.0
Alaska	17.4	16.5	17.8	16.6	(1)	23.7	21.2	25.9	19.1	(1)	132	121	78	131	(1)	2.3	3.3	.5	4.5	(1)
Hawaii	7.3	7.5	7.9	8.8	8.7	22.6	21.7	22.1	22.4	21.8	44	54	59	69	73	2.2	3.5	3.8	4.7	4.5

[1] Data not available.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*

[Rates provisional for all years]

State	Typhoid and paratyphoid fever (1, 2)					Cerebral (meningococcus) meningitis (6)					Scarlet fever (8)					Whooping cough (9)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	1.6	1.7	2.1	2.0	2.8	0.8	0.8	2.2	4.1	0.9	0.5	0.5	0.6	0.4	0.5	4.2	5.9	6.0	6.8	2.7
California	(1)	.7	.9	.9	1.1	(1)	.4	.7	1.6	2.0	(1)	.4	.4	.7	1.5	(1)	.7	2.1	4.2	2.0
Colorado	.6	1.9	2.1	2.9	3.1	.4	.7	.5	3.0	2.8	.5	1.0	1.1	2.0	7.1	2.9	4.6	4.2	4.6	4.1
Connecticut	.3	.4	.4	.4	.5	.4	.2	.2	.8	.7	(2)	.2	.2	.7	.7	.2	1.3	.7	1.4	1.9
Delaware	.7	2.6	1.5	2.3	2.7	.7	1.5	.4	1.5	1.2	1.1	.4	.8	.4	2.0	2.2	3.0	5.4	6.6	5.1
District of Columbia	.7	.8	1.0	2.0	1.7	.7	.6	1.4	4.9	10.9	.3	.2	.5	.8	.3	1.6	2.3	1.0	2.8	8.7
Florida	1.3	1.5	2.5	2.9	2.5	.4	.5	.8	4.0	3.7	.1	.3	.2	.1	.1	1.7	3.1	3.6	3.5	1.5
Georgia	2.0	2.6	3.9	4.4	6.3	.3	.5	.6	1.2	2.1	.5	.5	.4	.4	.5	3.3	4.0	7.3	4.6	2.0
Idaho	1.1	3.1	2.9	1.8	2.4	.9	1.7	1.8	1.0	5.9	1.3	.4	1.0	1.8	10.1	1.3	1.9	2.7	3.2	1.6
Illinois	.4	1.4	.8	.7	.9	.2	.2	.3	1.2	2.3	.8	.9	1.7	2.0	3.0	.8	2.0	2.2	1.9	1.9
Indiana	.8	1.1	.7	1.1	1.7	.3	.4	.7	1.6	2.1	1.2	1.4	2.0	3.0	3.4	2.2	1.8	1.3	4.7	1.6
Iowa	.4	.6	.8	.9	1.3	.6	.4	.6	1.0	2.0	.7	.9	1.8	3.8	3.1	.9	1.7	2.6	3.4	1.4
Kansas	.6	.7	.7	.9	1.7	.6	.4	.3	1.4	1.1	.5	.7	1.4	3.6	4.2	1.8	.4	2.8	2.5	.9
Kentucky	2.5	4.3	4.9	5.7	7.4	1.2	1.2	2.2	3.1	6.2	1.0	1.1	1.5	1.8	1.6	6.1	2.4	6.6	8.6	2.6
Louisiana	3.7	5.8	5.0	5.9	6.6	.6	.6	.9	1.2	1.7	(3)	.2	.3	.6	.2	6.4	4.8	3.9	1.4	4.4
Maine	.6	1.1	1.9	1.7	.8	1.1	.4	.1	1.1	1.0	.7	.4	(3)	.5	.8	2.5	3.6	3.0	3.1	2.8

Kentucky	2.5	4.3	4.9	5.7	7.4	1.2	1.2	2.2	3.1	6.2	1.0	1.1	1.5	1.8	1.6	6.1	2.4	6.6	8.6	2.6
Louisiana	3.7	5.8	5.0	5.9	6.6	.6	.6	.9	1.2	1.7	(3)	.2	.3	.6	.2	6.4	4.8	3.9	1.4	4.4
Maine	.6	1.1	1.9	1.7	.8	1.1	.4	.1	1.1	1.0	.7	.4	(2)	.5	.8	2.5	3.6	3.0	3.1	2.8
Maryland	.6	.9	1.8	1.8	1.6	.3	.6	.7	2.5	6.8	.4	.3	.5	.8	.7	3.5	1.1	2.9	5.5	4.9
Massachusetts	.2	.3	.3	.3	.3	.3	.4	.6	1.5	2.3	.3	.3	.6	.9	1.0	.5	1.0	.8	2.2	1.2
Michigan	.2	.6	.6	.6	.7	.2	.3	.4	.8	1.2	.8	1.3	1.7	3.0	2.4	1.2	1.5	2.3	2.7	2.2
Minnesota	.2	.1	.3	.3	.5	.2	.2	.4	.9	1.8	.5	.6	.9	1.5	4.0	1.1	.6	1.7	2.7	1.2
Mississippi	1.4	2.0	3.0	3.6	4.3	.6	1.1	.5	1.2	1.1	.1	------	.3	.1	.2	5.9	6.8	7.0	5.3	2.3
Missouri	(1)	2.6	3.0	4.5	5.6	(1)	.5	.5	1.3	2.1	(1)	.8	2.0	2.8	2.4	(1)	1.8	4.6	5.0	1.8
Montana	.7	2.2	.9	2.0	1.8	1.2	.9	1.8	1.3	4.2	1.6	1.6	1.8	2.0	8.3	.9	2.9	8.6	2.5	3.0
Nebraska	.4	.4	.5	1.1	.9	.3	.2	.4	1.1	1.4	.9	1.0	1.1	2.6	4.9	.8	1.0	2.6	2.1	1.7
Nevada	.9	.9	2.8	(3)	1.9	.9	.9	(3)	1.0	3.9	(2)	(2)	(2)	1.9	7.8	2.7	(3)	2.8	1.9	3.9
New Jersey	.3	.4	.4	.7	.7	.1	.5	.5	1.1	1.8	.4	.5	.3	.4	.8	.6	1.1	1.3	1.2	1.4
New Mexico	3.0	3.2	4.1	5.6	7.3	.6	1.0	.8	1.0	2.9	.6	.4	1.0	1.4	4.1	9.5	7.1	12.3	9.6	6.5
New York	.3	.3	.5	.5	.6	.4	.5	.8	1.2	2.2	.3	.4	.5	.7	1.4	1.0	1.0	1.3	1.3	1.1
North Carolina	1.1	1.3	2.0	2.3	2.2	.3	.5	.9	1.2	1.6	.3	.4	.6	.5	.7	2.5	6.4	7.6	4.9	1.1
North Dakota	.6	.6	.3	.5	.6	.3	.5	1.4	2.0	1.1	.8	1.1	2.8	1.8	5.0	2.2	2.0	9.7	1.5	.6
Ohio	.7	.7	.8	1.5	1.7	.4	.2	.7	1.4	2.1	.6	1.1	1.2	1.9	2.3	1.8	1.2	1.8	4.2	2.7
Oklahoma	2.5	3.4	4.1	5.8	5.6	.9	.5	1.0	2.1	4.0	.3	.7	.9	1.4	1.9	2.4	1.0	7.9	3.6	1.7
Oregon	(1)	1.5	.5	.8	1.6	(1)	.6	1.2	.7	1.4	(1)	.5	.9	1.0	1.7	(1)	.7	2.0	2.1	1.9
Pennsylvania	.6	.6	.9	1.1	1.1	.6	.6	.7	1.3	1.2	.5	.6	1.2	1.5	1.6	1.3	1.5	1.7	2.7	1.5
Rhode Island	1.0	.1	.4	.1	.4	.3	.6	.9	2.2	3.1	(2)	(2)	.4	1.6	1.9	.3	2.0	1.1	3.0	1.0
South Carolina	4.1	5.1	6.5	6.5	10.2	.4	.4	.8	1.0	2.6	.1	.2	.5	.3	.7	2.6	6.5	14.3	4.6	3.5
South Dakota	(2)	1.2	1.2	1.1	1.6	.6	.8	.3	1.1	.6	.6	1.2	1.1	3.0	3.7	.6	.9	7.8	3.2	.6
Tennessee	2.1	3.3	3.7	4.9	5.1	.6	.7	1.7	2.5	3.7	.5	.6	.7	.7	.8	3.9	3.3	7.1	4.8	2.5
Texas	3.1	4.5	6.2	6.3	6.5	.5	.3	.6	1.5	2.1	.2	.3	.5	.8	1.0	3.7	3.3	5.9	5.9	2.2
Utah	.5	.4	.4	.7	1.5	.5	.9	1.3	1.7	3.4	1.1	.4	.9	1.7	8.2	1.8	1.1	2.8	2.6	4.1
Vermont	.8	.3	.3	1.1	1.7	1.4	.6	(2)	2.5	1.7	.3	1.1	.3	.3	.8	1.7	6.7	3.1	.8	2.8
Virginia	1.0	1.8	2.1	2.0	2.8	1.2	.9	1.6	4.1	5.4	.4	.3	.3	.3	.5	4.7	5.8	7.1	8.1	4.5
Washington	.7	1.0	.8	.7	1.1	.5	.5	.6	1.2	1.5	.4	.7	.5	1.0	1.5	1.1	.2	1.9	1.8	.8
West Virginia	1.9	2.9	3.5	4.5	4.2	1.5	1.9	1.7	4.5	5.8	1.0	1.1	2.0	1.9	2.2	6.2	2.2	7.2	13.2	3.9
Wisconsin	.1	.2	.2	.4	.4	.2	.2	.3	.7	.9	.7	1.1	1.2	2.2	4.2	1.1	1.4	1.8	2.0	1.4
Wyoming	.8	2.8	2.0	1.2	.4	2.8	.8	.8	2.5	2.1	.4	.4	2.4	3.7	9.1	.4	.4	13.4	4.9	1.2
Alaska	(2)	(2)	1.4	1.4	(1)	1.4	(3)	(2)	12.9	(1)	(2)	8.3	1.4	1.4	(1)	21.8	26.3	53.6	31.6	(1)
Hawaii	2.4	1.9	2.4	1.7	2.3	.5	.5	.5	.5	1.8	(2)	(2)	.2	(2)	(2)	1.9	7.2	5.4	2.5	.5

[1] Data not available.
[2] No deaths reported.
[3] Less than 1/16 of 1 per 100,000 population.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

	Diphtheria (10)					Tuberculosis, all forms (13-22)					Malaria (28)*					Influenza (grippe) (33)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	2.1	2.9	3.8	3.5	4.2	52.1	55.2	57.4	63.0	66.2	7.0	7.2	7.9	8.2	12.7	32.7	34.4	26.7	52.0	50.2
California	(1)	.9	1.5	1.6	2.0	(1)	57.3	61.1	67.5	71.6	(1)	-------	.1	.2	.1	(1)	3.5	3.9	19.4	11.1
Colorado	1.2	2.9	3.3	3.1	3.4	52.9	55.5	57.6	64.3	76.2	-------	-------	-------	-------	-------	13.7	22.8	13.4	48.0	32.5
Connecticut	.2	.4	.7	1.4	.5	32.4	34.3	36.8	37.9	40.0	-------	-------	-------	-------	-------	4.4	4.7	4.5	12.2	8.3
Delaware	(2)	.8	.8	.4	1.2	46.8	57.1	50.1	56.1	50.0	-------	-------	-------	-------	-------	10.5	12.9	10.7	22.8	10.9
District of Columbia	.4	.8	1.1	2.3	4.7	64.9	66.1	71.7	90.4	110.5	.1	.2	-------	-------	-------	6.9	9.2	5.2	16.0	7.9
Florida	1.4	1.9	1.9	3.2	3.5	50.0	49.4	54.5	57.5	54.6	5.2	6.1	8.9	12.2	21.6	28.8	27.7	20.7	39.5	53.5
Georgia	1.8	2.9	3.3	3.4	3.8	47.2	46.4	50.4	49.7	55.4	2.8	3.1	4.9	7.0	20.0	28.7	29.1	24.9	44.9	59.2
Idaho	.2	.8	.6	1.2	.6	17.8	18.7	19.4	20.3	24.0	.8	.2	-------	-------	-------	17.8	17.5	16.3	38.8	18.6
Illinois	1.1	1.5	1.5	2.0	2.2	46.2	45.8	47.0	51.1	52.0	.2	.4	.4	.5	.7	8.1	12.3	5.6	17.1	14.6
Indiana	1.0	1.6	2.4	1.6	2.9	37.6	41.4	39.4	46.8	48.4	.3	.2	.3	.6	.1	21.9	26.0	12.7	33.3	29.0
Iowa	.5	.6	1.0	.4	1.0	16.0	17.4	18.3	20.5	22.4	-------	(3)	(3)	.1	.1	15.9	23.7	12.6	32.7	20.1
Kansas	.7	.4	1.0	1.3	2.3	24.7	23.5	23.6	27.2	29.9	.3	.1	.2	.2	.3	18.4	18.9	15.8	34.8	48.7
Kentucky	1.8	3.2	4.0	4.9	5.1	66.4	70.3	69.7	72.4	71.6	.6	1.1	1.1	1.4	1.8	28.2	33.8	25.5	50.7	43.3
Louisiana	2.1	2.9	3.2	3.1	4.0	58.8	58.8	61.7	66.2	68.0	3.7	5.0	7.9	7.9	11.7	32.7	23.1	23.2	49.9	46.3
Maine	.7	2.1	2.0	.6	.8	29.5	35.1	30.2	32.4	40.9	.1	-------	-------	-------	-------	12.6	20.2	15.3	38.6	25.6
Maryland	.4	1.1	1.0	1.2	1.5	78.6	72.1	74.4	79.3	79.2	-------	-------	.2	.1	.1	8.4	9.7	7.4	16.5	11.2
Massachusetts	.2	.3	.4	.4	.6	37.4	37.1	38.1	42.1	43.7	-------	(3)	(3)	(3)	-------	3.4	5.4	3.6	9.7	6.4
Michigan	.4	.5	.9	1.4	1.1	33.3	36.5	37.0	42.9	43.5	-------	(3)	-------	.1	.1	5.1	14.5	6.3	17.3	11.9
Minnesota	.2	.4	.5	.5	.6	26.4	28.8	28.3	33.0	34.7	-------	-------	-------	-------	(3)	8.4	11.7	8.8	23.2	13.9
Mississippi	2.4	2.5	3.7	2.4	3.3	44.5	48.5	54.1	61.0	53.5	7.2	9.6	12.5	14.1	15.6	36.6	37.5	31.0	57.1	62.6
Missouri	(1)	2.0	3.3	2.5	2.1	(1)	47.4	51.4	58.2	61.9	(1)	1.8	2.1	2.5	2.8	(1)	20.0	15.1	36.7	41.1
Montana	1.1	1.6	1.6	1.4	2.0	40.2	42.7	42.5	42.5	39.7	-------	-------	-------	-------	.2	13.7	23.3	19.1	54.1	23.4
Nebraska	.8	1.0	1.2	1.1	1.6	17.0	16.5	16.4	19.5	18.4	-------	-------	-------	-------	-------	19.9	17.1	11.3	42.2	21.7
Nevada	.9	(2)	2.8	(2)	1.0	67.7	52.4	58.1	82.1	85.4	-------	-------	-------	-------	-------	11.7	6.4	.9	8.6	25.2
New Jersey	.6	.6	.8	.7	.5	42.8	43.2	46.2	48.8	52.8	-------	(3)	-------	-------	(3)	4.2	5.8	4.8	10.5	8.3
New Mexico	1.3	2.9	3.3	3.6	3.3	70.7	72.6	76.7	106.3	104.9	.7	.8	.2	-------	.4	13.7	19.9	10.7	32.7	29.9
New York	.1	.2	.3	.6	.5	46.2	47.9	48.8	56.0	57.4	.1	.2	.3	.2	.1	3.1	4.1	3.5	9.9	6.4
North Carolina	3.3	4.9	5.1	4.8	5.6	49.7	51.0	53.6	54.6	61.3	1.8	1.7	2.2	2.7	4.4	21.1	17.9	14.2	25.4	32.6
North Dakota	1.4	2.0	.9	1.7	1.7	20.0	21.9	21.6	28.1	26.7	-------	-------	-------	-------	-------	9.2	17.5	11.7	29.8	13.6
Ohio	.4	.9	1.3	1.6	1.5	39.9	42.6	45.1	48.7	52.1	.1	(3)	(3)	-------	.1	14.7	18.7	11.1	29.7	19.7
Oklahoma	3.2	3.3	5.2	4.1	3.8	47.6	45.7	48.9	52.4	54.8	1.0	2.2	3.5	3.6	4.0	24.4	21.9	17.2	43.5	49.4
Oregon	(1)	.2	.9	.8	.9	(1)	29.2	28.2	33.1	35.7	(1)	.1	-------	.1	.1	(1)	9.2	8.5	28.1	19.3
Pennsylvania	.4	.7	1.0	1.0	1.3	39.5	40.2	42.2	47.0	46.0	-------	(3)	(3)	.1	.1	10.8	12.3	10.1	27.6	16.6
Rhode Island	.3	.1	.1	.4	.1	33.0	37.5	39.6	46.1	47.6	-------	-------	-------	-------	-------	4.3	5.1	4.7	10.8	9.1
South Carolina	2.9	4.3	2.8	3.6	4.0	46.9	44.2	48.9	51.0	53.8	6.8	9.0	11.9	14.1	23.6	33.7	29.6	28.7	43.0	50.3
South Dakota	.8	3.2	1.5	.8	.7	34.3	29.2	36.4	39.0	35.7	-------	-------	-------	-------	-------	15.4	21.1	14.7	40.5	21.0
Tennessee	1.6	3.0	3.7	4.8	5.5	72.8	78.5	76.2	84.8	89.4	2.2	3.4	3.6	3.6	5.6	31.0	31.8	26.0	47.9	55.6

Texas	2.3	2.6	3.8	3.9	5.6	56.4	57.0	65.5	68.7	70.6	2.4	2.2	4.0	5.8	8.0	26.4	20.7	24.3	52.3	52.6
Utah	(2)	.9	1.1	1.1	.9	15.8	16.3	18.3	19.7	20.8	------	------	------	------	------	19.8	12.8	9.4	23.2	20.8
Vermont	(2)	.8	3.6	.6	(2)	36.5	39.0	37.1	50.4	45.1	------	------	------	------	------	12.8	25.9	14.2	32.1	32.8
Virginia	2.0	3.7	4.4	3.2	4.0	58.5	60.0	66.5	62.8	68.9	.2	.3	.1	.3	.7	25.1	22.2	19.1	40.3	39.3
Washington	.6	.7	.6	.9	.4	40.8	41.6	41.9	45.5	48.9	------	------	------	------	------	17.2	8.5	10.2	23.8	25.6
West Virginia	2.0	3.2	3.6	4.9	7.1	45.5	46.4	49.8	52.9	54.2	.1	------	.1	.1	.1	18.6	19.6	19.0	42.5	33.7
Wisconsin	.2	.1	.5	.8	.5	26.0	27.3	29.5	33.1	34.4	(3)	------	------	------	.1	11.4	17.3	7.6	37.5	15.1
Wyoming	1.6	1.2	2.8	(3)	3.7	15.9	22.9	23.2	18.1	17.4	------	------	------	------	------	10.7	11.3	12.6	44.4	23.2
Hawaii	1.4	1.0	.5	2.7	1.8	61.2	66.9	65.1	79.1	86.1	------	------	------	------	------	8.5	3.8	5.4	9.2	13.1
Alaska	4.1	1.4	2.8	(2)	(1)	365.9	361.5	409.2	365.2	(1)	------	------	------	------	(1)	10.9	22.2	36.7	34.5	(1)

* Leaders indicate no deaths reported.
1 Data not available.
2 No deaths reported.
3 Less than 1/10 of 1 per 100,000 population.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Measles (35)					Acute poliomyelitis and polioencephalitis (36)					Acute infectious encephalitis, (lethargic) (37)					Cancer and malignant tumors (45-55)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	1.2	2.1	6.0	0.1	0.7	0.7	0.5	0.6	0.7	1.4	0.6	0.4	0.6	0.4	0.4	64.4	60.3	59.4	59.6	61.4
California	(1)	.9	.9	.5	2.3	(1)	1.1	.2	1.2	.6	(1)	.4	.6	.8	.5	(1)	141.7	137.9	132.2	136.2
Colorado	1.3	1.3	2.7	.5	.7	1.2	1.1	.6	4.4	1.4	.7	.5	1.5	1.0	1.0	118.8	112.6	113.2	111.2	116.7
Connecticut	.2	.5	.1	.7	.4	.1	.1	(2)	.5	.1	.2	.1	.1	.4	.2	136.0	138.6	143.1	130.5	129.8
Delaware	(2)	(2)	.8	1.5	3.1	.7	.4	.4	.4	.4	(2)	1.1	(2)	.4	.4	138.4	109.4	117.5	100.0	123.4
District of Columbia	(2)	.3	.3	2.1	1.3	.4	.2	.5	.7	.3	.7	.2	.5	.8	.7	151.3	156.4	137.6	142.1	141.7
Florida	.3	.7	1.5	.3	.4	.4	.3	.6	.3	.4	.3	.4	.5	(2)	.5	93.9	92.6	84.3	97.3	88.4
Georgia	.7	1.6	4.8	.3	.2	.2	.5	.6	.6	.9	.1	.1	.3	.2	.3	60.7	61.3	60.6	57.6	56.4
Idaho	.9	.8	.8	2.8	2.2	.6	1.5	.2	.4	1.0	.9	1.5	1.2	.8	1.2	88.6	89.1	83.1	81.9	78.0
Illinois	.2	(2)	2.6	.3	.1	.7	.3	.2	1.2	1.0	.3	.2	.4	.5	.4	143.0	141.9	137.1	132.3	131.9
Indiana	.1	.2	3.1	.4	.1	2.1	.1	.3	.8	.4	.6	.5	.7	.5	.6	122.3	112.1	113.8	110.0	111.3
Iowa	.5	1.1	1.0	.2	.1	2.2	1.1	.4	1.5	.5	.8	.7	1.0	.6	.5	130.1	124.5	128.5	126.1	122.2
Kansas	.9	.2	1.3	.2	.2	2.2	.3	(2)	1.9	.6	.8	1.6	1.2	1.3	1.1	122.3	124.4	123.9	118.6	120.5
Kentucky	.6	1.1	3.8	3.0	2.7	1.4	1.2	1.0	1.1	1.2	.5	.8	.3	.7	.8	82.9	81.2	73.8	71.6	74.6
Louisiana	.5	4.1	.9	.7	2.2	.8	.4	.4	.9	.5	.2	.3	.4	.3	.2	87.5	76.7	80.9	76.3	75.6
Maine	1.1	.6	2.1	.4	2.5	.2	.7	.5	1.8	.4	.4	.6	.1	.2	.2	151.5	151.7	151.1	147.4	155.8
Maryland	.1	.9	.4	2.2	1.5	.3	.1	.1	1.0	.1	.4	.4	.9	1.4	1.0	138.1	131.8	128.6	127.8	123.1
Massachusetts	.3	.4	.3	.6	.8	(2)	.1	.2	.5	.2	.2	.2	.2	.3	.3	171.2	160.4	160.4	151.0	152.0
Michigan	.3	.6	2.0	.2	.2	1.3	.8	.2	1.0	.5	.3	.1	.2	.2	.4	117.8	116.7	114.2	111.8	114.7
Minnesota	.2	2.3	.9	.3	.8	.9	1.9	.3	1.9	.2	.5	.3	.7	.9	.6	133.4	134.2	135.8	136.8	130.0
Mississippi	.3	3.6	3.6	2.8	1.2	.6	.6	1.0	2.8	1.1	.5	.3	.4	.6	.3	62.6	61.8	64.9	62.6	56.1
Missouri	(1)	.3	5.2	.5	.4	(1)	.5	.4	2.0	.6	(1)	.4	.6	4.0	.9	(1)	133.5	132.2	125.8	125.4
Montana	.9	2.9	2.0	.7	.5	1.4	(2)	.4	1.3	.5	1.8	1.4	5.4	.9	.4	110.7	114.8	98.2	104.6	102.1
Nebraska	.5	1.0	.8	.3	.7	1.6	.6	.5	3.3	.7	.5	.4	.8	.9	.4	124.8	117.9	122.2	115.0	115.1
Nevada	(2)	1.8	(2)	(2)	(2)	.9	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1.0	114.7	112.2	102.1	67.7	92.1
New Jersey	.2	.1	.7	1.3	.4	.1	.7	.2	.5	.2	.6	.5	.7	.6	.9	146.2	140.3	134.3	131.5	134.0
New Mexico	.9	.8	10.0	8.6	2.4	.6	1.5	.8	1.4	1.4	(2)	.4	(2)	(2)	.6	58.4	52.9	52.7	48.1	47.8
New York	.1	.4	.7	.4	1.0	.1	.4	.2	.4	.1	.9	.4	.7	.6	.5	158.0	154.4	151.6	147.6	144.9
North Carolina	.3	1.8	7.0	1.2	.3	.3	.3	.3	.6	.4	.3	.2	.4	.4	.4	57.5	56.2	54.5	54.7	52.3
North Dakota	.3	3.4	2.9	(2)	.5	.6	.3	(2)	(2)	.5	2.0	1.7	4.2	.6	.8	95.8	98.1	94.8	87.5	89.4
Ohio	(2)	.1	2.6	1.5	.6	.8	.2	.2	.8	.8	.5	.6	.4	1.0	.9	135.1	132.1	127.5	119.6	124.6
Oklahoma	.2	3.2	2.4	1.0	.6	1.2	.4	1.0	2.5	1.5	.6	.6	.3	.3	.8	82.6	78.6	75.3	77.9	72.4
Oregon	(1)	.7	.5	.1	4.0	(1)	.4	.6	.7	.9	(1)	.7	1.4	1.1	1.8	(1)	128.4	133.4	118.8	132.3
Pennsylvania	.1	.1	2.4	.8	.3	.3	.5	.2	.5	.2	.6	.6	.7	.7	.6	123.6	123.3	121.0	119.2	115.8
Rhode Island	.4	.4	(2)	.4	.7	.3	(2)	.1	(2)	(2)	.3	(2)	.6	.3	.3	157.4	151.1	154.9	153.7	144.5
South Carolina	.7	.5	7.6	.9	.5	.5	2.2	.5	.7	.9	.3	.2	.4	.3	.2	55.8	54.4	54.3	51.0	50.0
South Dakota	.5	4.3	.8	(2)	.3	.8	.6	.3	1.2	.1	.2	.5	1.1	1.2	.3	105.3	104.3	91.1	87.9	91.7
Tennessee	.6	1.5	6.9	1.1	.8	.3	.5	.7	1.2	1.6	.6	.7	.5	.8	.9	73.5	70.9	73.0	68.9	67.2
Texas	3.1	1.3	1.8	3.5	2.7	.6	1.1	.7	2.0	.6	.4	.3	(2)	(2)	.4	75.5	67.6	72.9	72.0	72.7
Utah																				

Utah	.9	.4	2.0	.7	1.1	1.1	1.3	(2)	1.3	.2	.4	.9	.2	.9	.6	90.5	91.8	84.8	88.1	78.4
Vermont	(2)	1.7	3.3	(2)	6.1	.3	1.4	1.1	.6	(2)	.3	.3	.3	(2)	.6	137.2	140.4	132.9	146.9	145.5
Virginia	.8	.8	3.4	2.5	1.1	1.0	.3	.3	.5	.5	.7	.3	.2	.6	.4	81.3	80.3	80.5	73.7	73.6
Washington	1.0	.9	.2	.8	2.0	2.0	.4	.2	.5	1.0	2.2	1.5	1.3	1.8	2.4	143.3	138.7	132.7	129.8	131.0
West Virginia	(2)	.3	6.2	2.2	1.6	3.2	.5	.8	1.1	1.2	.3	.6	.5	.2	.5	76.2	74.9	74.6	74.1	70.4
Wisconsin	.3	.6	1.2	.2	.4	1.4	.4	1.2	1.2	.1	.8	.3	.3	.5	.7	132.9	127.3	130.2	126.7	126.1
Wyoming	2.4	.4	(2)	.4	(2)	2.8	1.2	1.2	2.9	.4	1.6	(2)	.8	1.6	.8	84.7	75.1	83.3	73.9	71.3
Alaska	159.1	54.0	1.4	4.3	(1)	(2)	(2)	1.4	2.9	(1)	(2)	1.4	(2)	1.4	(1)	74.8	70.0	66.3	61.8	(1)
Hawaii	(2)	(2)	.2	46.7	6.8	1.2	1.4	.5	.5	.3	(2)	.2	.5	.2	.8	67.3	71.2	67.1	74.4	69.4

[1] Data not available.
[2] No deaths reported.
[3] Less than 1/10 of 1 per 100,000 inhabitants.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Diabetes mellitus (61)					Pellagra (except alcoholic) (69)*					Cerebral hemorrhage, embolism and thrombosis (83a, b)					Diseases of the heart (90–95)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	12.1	12.2	12.5	10.8	12.8	8.5	10.0	12.4	11.2	11.1	77.9	70.1	71.9	69.9	71.7	178.7	170.6	173.4	168.8	152.8
California	(1)	24.0	23.3	24.0	22.6	(1)	.6	1.0	1.1	1.3	(1)	85.0	83.3	79.8	80.0	(1)	339.4	329.8	340.8	313.6
Colorado	18.2	18.2	17.1	16.1	18.4	.1	.1	.1	.2	.5	85.3	86.6	85.8	83.6	84.5	249.6	254.5	256.2	294.9	260.0
Connecticut	22.8	29.2	30.1	31.7	29.3	.2	.1	.1	.3	.3	99.1	82.1	88.1	88.5	83.3	299.4	293.1	254.7	243.3	247.3
Delaware	31.8	33.7	33.7	30.2	29.7			.4			105.5	115.4	93.0	115.0	115.2	355.1	363.3	365.9	367.3	350.4
District of Columbia	32.2	23.8	26.0	29.3	27.6	.1	.2	.6	.8	.5	92.9	83.8	83.8	97.3	104.3	347.2	344.1	341.7	334.2	350.9
Florida	19.5	20.6	18.2	17.7	18.6	3.8	4.0	5.7	6.2	8.1	111.6	98.5	93.0	113.7	112.5	284.5	243.6	241.9	241.3	238.4
Georgia	10.9	11.4	13.1	12.2	12.6	7.3	8.5	11.6	11.8	12.6	91.4	93.1	85.2	83.8	83.1	190.8	167.0	165.8	168.6	181.1
Idaho	17.8	20.0	13.7	12.3	15.3	.6	.4			.2	61.7	60.9	61.3	68.7	72.1	242.9	241.8	203.2	148.0	182.6
Illinois	33.3	30.0	27.7	27.3	29.4	.2	.3	.2	.2	.2	81.9	75.1	73.6	72.2	79.6	349.6	338.6	316.3	304.1	319.5
Indiana	14.7	16.6	16.1	15.1	16.9	.1	.1	.1	.5	.5	141.0	132.2	123.2	123.4	131.3	304.4	249.6	238.2	251.4	273.5
Iowa	26.5	24.5	22.0	21.7	23.5		.2	(2)	.2	(3)	106.1	103.1	99.7	104.9	105.4	279.8	288.2	245.6	223.7	234.4
Kansas	26.0	26.7	24.6	23.9	23.5	.4	.3	.3	.4	.7	101.3	101.1	102.3	103.4	105.6	275.1	259.1	247.1	250.5	248.5
Kentucky	14.3	13.0	13.3	11.1	15.1	1.9	2.8	2.2	2.7	3.1	104.1	106.6	103.1	91.8	83.9	215.9	217.9	188.0	173.6	207.1
Louisiana	18.1	16.3	16.2	16.7	16.3	2.7	3.5	6.3	4.3	5.5	68.0	68.2	64.4	63.5	66.8	251.0	214.9	200.7	197.2	185.3
Maine	31.1	27.3	27.5	21.0	29.0		.5	.2	.1	.1	129.4	126.7	115.6	130.9	129.9	361.1	376.9	343.7	369.7	354.6
Maryland	31.3	29.2	27.1	25.0	26.3	.2	.4	.3	.4	.5	97.0	96.3	96.5	102.8	105.8	346.7	313.7	308.5	293.2	291.3
Massachusetts	36.5	35.1	33.3	34.1	32.0	.1	.2	.2	.3	.3	105.5	103.4	97.9	97.1	98.4	421.9	407.3	372.6	336.9	352.8
Michigan	26.6	26.2	25.3	25.4	26.2	.2	(2)	.1	(3)	.1	89.9	82.6	85.4	85.0	93.9	295.2	287.1	273.7	266.6	276.3
Minnesota	25.9	25.9	24.9	23.2	25.1	.1		.1	.1	.1	91.4	91.8	83.5	84.1	84.2	272.9	253.6	241.3	226.1	237.5
Mississippi	12.8	12.2	12.0	11.4	10.6	6.8	8.8	12.4	11.1	11.8	71.4	71.6	63.1	67.5	65.2	152.0	153.6	147.2	137.8	124.1
Missouri	(1)	25.0	23.1	22.8	24.0	(1)	.8	.6	.5	1.0	(1)	93.5	90.7	96.7	96.9	(1)	278.3	270.0	271.4	276.5
Montana	11.6	17.2	17.7	19.7	21.6		.2		.2	.2	96.4	84.7	92.1	83.6	88.7	237.6	231.9	208.5	215.4	186.6
Nebraska	26.8	25.0	25.4	26.7	25.2	.1		.1	.2	.1	114.0	91.4	85.4	90.5	91.1	234.4	210.2	223.3	225.4	224.7
Nevada	20.8	9.2	12.2	13.4	12.6	.9	.9		1.0		65.9	67.2	76.8	71.6	66.9	309.7	264.0	266.9	246.2	281.3
New Jersey	36.4	33.6	30.7	31.9	32.2	.3	.1	.2	.2	.2	90.3	86.6	84.6	80.4	85.0	358.9	356.7	339.3	325.4	317.4
New Mexico	9.4	8.6	7.2	6.8	7.5	3.6	2.9	3.5	3.6	4.3	40.2	38.8	43.0	43.3	39.1	116.2	108.5	113.4	121.9	116.7
New York	40.5	39.1	35.5	36.3	35.7	.1	.2	.2	.2	.2	72.2	66.9	63.3	73.1	77.5	384.4	366.6	355.7	353.9	344.2
North Carolina	13.6	13.8	10.9	11.1	11.7	4.7	5.8	7.3	9.5	10.3	84.7	80.2	81.9	80.1	92.2	152.2	161.5	164.1	161.0	176.9
North Dakota	25.6	21.9	21.0	19.0	20.1	.2					69.3	77.7	69.0	73.0	72.3	205.6	206.4	160.4	177.4	172.0
Ohio	31.2	29.2	27.0	26.5	27.3	.1	.1		(3)	.4	111.1	107.9	104.1	106.4	114.8	315.2	298.0	276.6	427.6	276.8
Oklahoma	14.0	14.7	13.8	13.8	15.6	2.2	4.2	4.5	4.3	7.4	80.6	85.9	68.0	67.5	68.5	162.4	152.1	140.1	140.5	146.8
Oregon	(1)	25.3	23.3	24.5	22.8	(1)	.3		.2	.2	(1)	107.1	99.5	99.7	106.2	(1)	283.3	266.2	267.2	271.6
Pennsylvania	35.4	33.8	31.1	32.0	28.4	.1	.1	.1	.1	.1	83.6	83.3	83.1	82.3	89.5	335.0	324.2	313.0	313.2	302.9
Rhode Island	38.7	36.9	40.4	41.5	33.6	(3)	.3	.3	.1	.1	99.8	87.6	94.3	96.8	97.9	372.9	362.8	352.8	362.0	353.2
South Carolina	12.7	13.4	12.1	11.6	11.1	8.5	7.8	12.2	14.6	14.9	104.9	95.7	93.4	94.6	107.4	203.0	185.9	188.7	187.4	179.8
South Dakota	23.9	26.7	19.6	20.6	22.2	.2				.1	82.0	76.1	71.1	72.6	84.9	207.4	201.1	172.4	174.9	159.3
Tennessee	14.0	13.4	11.1	11.5	11.5	3.6	5.1	7.1	7.1	8.7	83.2	80.7	81.2	80.6	82.0	186.8	173.5	162.6	161.5	164.7
Texas	13.6	11.8	11.9	12.5	12.6	5.1	5.7	8.6	9.3	11.5	62.4	60.5	69.3	68.5	61.4	178.9	166.2	119.3	122.3	166.0
Utah	19.6	18.3	19.9	18.4	19.6	.4	.2		.2		58.4									

Utah	19.6	18.3	19.9	18.4	19.6	.4	.2	-------	.2	-------	58.4	54.1	52.0	58.2	48.3	245.9	233.4	224.3	220.0	210.9
Vermont	27.6	32.6	30.7	20.1	27.0	-------	-------	-------	.3	-------	119.4	115.9	110.9	103.4	121.9	332.1	359.6	301.5	332.2	376.7
Virginia	20.3	17.5	16.6	16.6	16.0	2.1	2.2	4.2	4.0	5.0	104.3	104.1	97.2	92.3	99.0	248.0	245.6	236.8	227.9	239.4
Washington	26.4	25.3	24.2	23.1	24.9	.2	.1	-------	.2	.2	106.6	105.7	105.9	100.5	102.1	344.9	288.5	275.8	296.8	277.3
West Virginia	17.2	17.6	16.2	15.2	14.6	.6	.3	.3	.6	.5	78.5	77.5	72.7	74.5	78.3	172.1	172.1	166.8	167.4	169.9
Wisconsin	28.1	27.0	28.1	25.2	28.2	.1	.1	.2	.1	.1	96.0	85.9	84.4	86.6	93.1	295.6	298.8	274.9	268.5	276.1
Wyoming	14.3	16.5	13.8	10.7	14.9	-------	.4	-------	-------	-------	66.0	57.5	57.3	81.3	71.7	201.3	208.7	206.9	245.2	200.2
Alaska	4.1	4.2	1.4	5.8	-------	-------	-------	-------	-------	-------	76.2	59.6	125.6	61.8	-------	208.1	227.2	242.7	279.0	-------
Hawaii	14.4	16.6	16.8	17.5	18.7	-------	-------	-------	.5	.3	43.7	47.6	54.9	45.4	48.2	128.5	126.3	126.6	119.8	131.8

•Leaders indicate no deaths reported.
‡ Data not available.
‡ Less than 1/10 of 1 per 100,000 inhabitants.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Pneumonia, all forms (107–109)					Diseases of the digestive system (115–129)					Diarrhea and enteritis under 2 years (119)					Nephritis, all forms (130–132)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	58.6	68.9	78.9	94.0	101.4	54.9	58.8	69.0	66.8	70.5	12.5	13.9	18.6	16.2	18.1	93.8	69.6	79.8	81.3	82.2
California	(1)	45.0	54.6	76.8	68.0	(1)	73.4	72.0	79.5	79.1	(1)	8.9	7.7	11.7	9.7	(1)	69.0	74.7	77.5	78.4
Colorado	78.1	88.3	101.5	163.3	131.3	76.1	65.0	71.2	81.1	101.7	14.8	12.1	13.8	26.0	23.6	70.8	73.0	83.6	77.6	84.3
Connecticut	38.3	42.3	51.0	69.5	73.0	44.7	48.5	49.7	49.3	51.3	1.9	2.1	3.4	3.1	2.7	55.5	76.4	80.7	80.4	88.0
Delaware	58.4	70.4	68.9	97.1	85.6	52.0	52.6	65.5	72.8	69.1	4.9	5.3	12.2	9.7	15.6	134.3	106.7	105.3	137.4	120.7
District of Columbia	80.1	72.4	86.6	124.0	144.0	83.0	81.3	76.6	81.6	87.3	10.2	11.5	11.4	11.9	15.6	110.0	105.2	102.0	100.4	109.5
Florida	56.1	56.2	68.5	73.4	85.5	68.3	76.8	82.8	98.5	85.4	7.6	10.5	12.1	11.0	9.5	89.3	91.2	90.6	109.3	104.4
Georgia	63.0	68.7	85.0	94.5	121.0	50.4	57.5	69.8	67.8	73.0	12.5	13.0	22.0	15.4	17.5	103.7	91.6	110.2	108.6	108.9
Idaho	41.2	56.7	76.2	75.9	108.3	55.0	56.1	54.5	70.5	63.4	6.5	5.8	4.9	9.0	7.1	57.1	53.2	54.9	62.7	61.9
Illinois	47.3	54.0	58.6	70.5	80.9	59.0	62.0	65.0	69.5	73.1	2.5	3.1	5.5	4.6	6.6	91.6	92.3	92.1	96.2	102.6
Indiana	58.6	68.7	70.6	94.5	99.9	(1)	50.2	56.0	53.7	72.8	3.5	5.5	8.6	8.8	9.1	73.9	64.6	64.9	65.8	76.6
Iowa	48.9	50.3	61.2	65.3	72.0	49.8	53.9	55.5	55.6	57.5	2.1	2.3	3.4	3.9	4.5	64.0	54.4	57.1	59.1	60.6
Kansas	35.9	43.8	51.3	61.1	86.6	55.0	60.2	61.9	64.1	74.2	3.8	4.0	5.1	6.2	7.0	95.7	97.1	95.7	89.5	99.8
Kentucky	62.3	73.1	76.3	93.8	104.4	57.8	66.8	77.3	75.6	84.0	13.7	19.0	30.4	23.4	39.0	73.9	65.8	72.1	69.4	76.2
Louisiana	76.7	80.2	90.8	98.5	112.4	63.9	66.6	71.2	69.7	76.6	14.9	12.4	16.3	15.3	16.3	86.8	90.7	93.4	97.2	100.9
Maine	54.8	74.1	75.7	96.1	99.2	53.4	55.5	59.1	60.7	68.2	5.3	5.6	7.8	14.4	6.2	88.3	81.4	83.8	83.6	89.7
Maryland	61.9	67.5	75.4	103.4	106.2	50.9	53.9	58.5	65.6	67.2	6.7	9.4	11.3	13.1	15.4	127.5	118.9	124.6	131.8	136.2
Massachusetts	61.1	71.3	73.5	94.5	97.2	53.9	55.7	56.2	60.5	60.6	3.0	2.0	2.7	2.8	3.5	70.4	67.2	68.8	70.4	73.4
Michigan	46.8	54.1	56.7	83.0	84.6	52.8	57.7	60.0	64.1	74.5	3.3	5.2	6.2	5.7	9.7	53.9	54.2	54.7	59.3	62.9
Minnesota	55.9	58.6	66.3	72.8	82.8	50.4	54.4	52.7	54.5	60.5	2.5	3.3	3.3	2.8	4.5	37.3	39.4	41.4	44.2	46.8
Mississippi	45.2	56.0	66.1	86.7	75.8	57.3	58.1	62.3	71.9	68.0	13.5	13.1	16.0	19.5	17.7	99.1	89.2	96.7	98.5	91.0
Missouri	(1)	77.6	88.5	117.6	124.0	(1)	67.3	68.1	66.4	89.9	(1)	9.0	11.4	11.6	16.0	(1)	112.5	108.0	106.0	122.8
Montana	58.7	66.2	74.6	101.5	117.0	69.8	67.8	63.9	71.7	85.3	7.0	5.2	5.8	6.9	11.1	57.0	57.9	56.6	56.6	71.1
Nebraska	46.9	51.7	54.7	62.3	73.3	52.4	55.4	52.4	63.0	76.0	2.4	2.2	2.4	4.1	4.9	64.4	65.8	60.5	64.7	70.9
Nevada	69.5	81.9	103.0	120.2	143.5	69.5	42.3	63.7	69.7	100.9	3.6	3.7	4.7	4.8	6.8	58.7	49.5	72.1	78.2	81.5
New Jersey	44.5	44.2	57.8	70.0	71.2	54.5	56.4	59.2	60.3	61.2	2.3	2.8	3.1	3.3	3.6	77.0	67.7	73.4	74.1	79.5
New Mexico	58.4	83.9	79.1	107.9	124.4	85.9	89.4	96.3	127.3	125.0	41.7	38.0	43.3	74.4	63.9	46.6	44.3	50.8	45.7	57.6
New York	45.5	55.3	61.5	86.0	87.5	57.1	59.2	60.4	66.3	67.2	3.0	4.3	4.6	5.8	6.0	65.6	65.7	69.2	74.0	77.5
North Carolina	57.0	61.4	78.3	85.2	101.7	52.1	63.5	76.6	71.7	65.6	13.1	19.0	29.5	24.9	23.7	95.7	82.4	88.2	85.4	98.1
North Dakota	40.2	54.8	54.5	72.7	59.6	49.1	53.7	53.1	59.4	72.3	5.8	7.0	7.6	10.9	13.1	43.5	41.0	44.0	38.5	44.6
Ohio	56.0	60.0	60.8	84.9	89.2	52.8	55.5	57.8	66.7	70.6	4.4	5.1	6.8	8.0	8.2	77.1	75.6	75.5	77.8	85.9
Oklahoma	57.4	61.3	62.1	78.6	98.1	59.7	64.6	61.0	70.7	75.8	10.4	9.4	10.3	14.1	16.4	61.9	54.7	61.6	67.1	62.2
Oregon	(1)	40.5	51.4	61.4	91.4	(1)	44.7	48.0	51.1	61.8	(1)	2.1	2.0	1.6	2.2	(1)	112.4	106.1	104.2	102.1
Pennsylvania	50.8	50.2	50.4	79.4	85.3	52.1	52.5	55.6	57.6	55.6	3.8	4.5	5.4	6.2	6.0	94.4	82.0	83.0	87.6	84.8
Rhode Island	54.0	57.4	79.2	93.2	95.4	55.2	60.3	60.7	59.7	60.9	2.0	4.0	5.1	5.1	3.8	98.0	96.1	102.4	106.8	106.6
South Carolina	67.9	64.0	85.9	93.0	104.8	51.7	43.3	39.4	30.1	42.1	6.5	7.0	11.1	9.1	16.4	92.8	88.5	90.7	93.2	94.9
South Dakota	36.5	54.8	55.5	73.4	68.6	53.8	60.0	55.0	57.0	62.6	5.1	5.4	5.7	4.8	10.5	48.2	42.8	40.6	46.1	62.8
Tennessee	71.0	70.6	80.6	95.4	119.8	58.8	64.7	75.8	76.9	82.0	10.6	12.8	22.1	18.0	20.8	64.5	59.8	63.8	66.7	69.4
Texas	52.5	53.0	68.9	85.5	99.5	80.7	78.4	67.4	74.8	91.4	29.1	25.7	24.6	31.1	26.5	58.3	53.0	56.4	59.4	61.0

Utah	43.5	45.2	63.1	61.5	92.4	54.8	53.4	63.3	65.5	75.2	3.6	2.2	5.3	3.7	9.5	49.9	53.9	52.2	55.2	56.5
Vermont	70.4	79.1	79.1	103.7	118.3	50.9	51.0	53.5	51.0	73.2	4.7	3.6	2.8	2.8	5.6	76.5	79.7	81.4	77.5	93.2
Virginia	69.5	67.3	71.8	98.3	97.2	48.2	53.1	60.0	53.8	59.8	8.8	11.1	16.2	12.8	13.8	105.0	85.3	83.8	86.8	94.7
Washington	47.8	50.7	65.6	68.5	75.6	56.5	52.2	58.3	56.8	65.2	2.2	2.2	3.1	3.1	3.2	71.3	63.8	66.4	74.1	73.0
West Virginia	59.7	61.8	70.1	92.8	108.9	46.2	62.3	71.3	72.1	91.7	8.3	18.1	26.2	20.0	31.6	69.3	65.6	70.0	66.9	67.1
Wisconsin	46.5	47.8	54.5	64.4	73.1	(1)	51.0	50.5	51.6	63.8	3.2	4.6	4.8	4.5	5.8	57.7	56.7	59.5	65.5	67.0
Wyoming	39.4	49.9	62.6	111.3	109.4	51.7	63.1	67.5	71.1	77.9	6.0	6.0	8.9	13.6	11.2	52.5	69.6	54.5	39.4	51.4
Alaska	144.2	169.0	186.3	159.6	(1)	28.6	41.6	38.1	56.1	(1)	4.1	(2)	(2)	8.6	(1)	23.1	27.7	16.9	15.8	(1)
Hawaii	45.8	54.1	75.1	93.3	75.0	48.2	53.2	54.9	66.1	71.5	5.7	11.1	12.4	19.0	22.2	66.9	65.2	62.7	72.1	68.7

State	All accidents, including automobile accidents (169–195)					Automobile accidents only (170a, b, c)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	57.2	70.9	69.8	75.8	72.8	20.8	22.0	21.2	24.4	25.0
California	(1)	89.4	90.4	100.4	100.4	(1)	41.2	41.0	47.8	47.8
Colorado	91.3	87.4	88.6	92.2	103.1	32.7	28.6	30.6	35.1	36.3
Connecticut	55.1	61.3	72.2	71.0	69.7	18.0	20.7	19.8	24.9	25.7
Delaware	79.0	71.9	80.4	107.6	94.5	36.3	29.1	26.8	43.3	34.0
District of Columbia	72.2	75.6	64.6	84.1	82.0	22.2	22.8	20.7	28.4	33.6
Florida	96.4	93.1	92.7	105.1	102.3	36.9	36.5	39.4	42.8	41.6
Georgia	63.6	55.9	67.3	75.9	90.5	24.8	19.9	24.9	29.8	32.3
Idaho	100.6	97.4	88.2	102.6	111.4	36.4	33.7	33.5	36.0	38.4
Illinois	73.7	71.3	74.7	81.5	99.9	29.6	28.4	27.7	33.4	32.2
Indiana	82.1	72.3	74.3	89.5	108.2	33.4	29.3	31.6	40.7	37.7
Iowa	63.5	65.8	65.8	76.2	87.1	20.0	19.4	19.1	24.2	22.1
Kansas	75.3	103.5	106.5	117.1	97.5	27.2	23.1	24.6	27.6	31.4
Kentucky	77.7	77.4	65.5	75.2	85.8	26.0	23.0	22.0	27.5	23.8
Louisiana	67.7	64.0	66.0	64.6	78.2	23.2	20.3	20.7	21.1	27.2
Maine	75.4	71.8	69.0	76.3	83.5	23.6	22.1	22.2	19.1	24.3
Maryland	79.4	69.8	68.6	87.7	84.9	28.3	22.0	21.7	30.6	27.6
Massachusetts	61.3	63.1	61.4	65.3	69.9	15.2	15.4	15.4	19.3	19.9
Michigan	74.9	72.4	70.8	90.1	99.7	32.6	27.3	27.5	40.0	40.1
Minnesota	68.0	67.6	67.8	72.9	97.8	21.9	21.6	23.4	24.2	26.8
Mississippi	70.2	59.8	63.3	65.4	75.1	20.1	19.4	19.3	21.7	23.2
Missouri	(1)	72.5	72.1	84.6	101.4	(1)	21.6	23.4	29.5	27.8
Montana	94.1	94.2	101.6	105.3	119.7	27.7	27.1	24.1	32.4	31.2
Nebraska	65.2	69.0	59.0	68.2	79.3	19.9	21.3	17.4	24.6	23.1
Nevada	173.4	190.4	134.8	152.7	178.5	76.8	69.9	56.2	57.3	71.8
New Jersey	64.7	59.1	61.5	76.0	72.4	22.5	20.4	21.3	28.0	25.8
New Mexico	88.1	85.4	80.4	105.7	93.2	39.8	38.6	28.9	41.5	41.5
New York	62.1	61.9	63.4	71.3	70.2	18.0	17.8	18.3	22.2	20.8
North Carolina	65.3	65.2	63.2	72.7	71.4	27.5	26.2	25.1	30.2	18.4
North Dakota	53.5	51.8	55.7	63.8	70.8	18.1	14.4	19.0	20.9	20.6
Ohio	87.3	83.2	80.5	93.3	103.0	29.7	27.7	27.4	36.4	35.1
Oklahoma	56.7	82.3	73.3	66.7	81.7	19.7	22.2	23.8	26.2	27.8
Oregon	(1)	92.3	91.3	87.7	107.2	(1)	30.1	31.0	32.5	34.9
Pennsylvania	57.2	54.7	59.5	68.6	78.9	17.2	16.7	17.6	22.4	24.8
Rhode Island	51.4	51.4	91.4	55.0	58.1	12.2	10.9	11.3	17.8	16.5
South Carolina	76.7	69.1	63.4	60.7	75.9	31.5	27.9	24.8	28.2	31.7
South Dakota	64.7	54.8	66.3	63.1	73.1	19.5	21.5	21.4	16.6	19.2
Tennessee	62.2	62.0	62.0	69.9	78.9	18.6	19.4	19.8	25.1	27.7
Texas	69.1	61.5	72.3	86.6	81.4	27.0	23.3	28.3	33.7	32.0
Utah	83.8	78.6	93.7	95.0	88.9	33.4	29.8	39.8	37.6	34.6
Vermont	61.2	66.3	68.8	70.0	87.1	19.2	22.0	20.6	18.1	27.8
Virginia	82.9	74.4	70.7	73.6	86.3	31.1	30.2	25.2	29.2	32.2
Washington	93.7	87.8	82.6	97.3	109.5	30.6	27.3	28.5	32.5	37.8
West Virginia	88.5	79.2	80.2	95.8	103.6	20.8	18.8	20.1	25.0	27.9
Wisconsin	75.0	76.3	68.4	79.4	86.5	24.2	22.8	22.3	28.4	25.2
Wyoming	106.2	113.4	109.3	124.5	126.8	53.7	47.4	39.4	51.3	47.2
Alaska	142.8	144.1	175.0	178.3	(1)	(2)	(2)	(2)	1.4	(1)
Hawaii	54.8	47.6	58.8	57.1	59.4	13.9	14.2	18.3	16.7	20.4

[1] Data not available.
[2] No deaths reported.

COURT DECISION ON PUBLIC HEALTH

Regulations of local board of health governing plumbers upheld.—(Georgia Court of Appeals, Division No. 1; *Abel* v. *State*, 13 S.E.2d 507; decided March 5, 1941.) In a case where a person was charged with unlawfully following the occupation of plumbing there was presented the question as to whether the regulations of a joint county and city board of health which were claimed to have been violated were so unreasonable as to make them invalid and void. These regulations, adopted pursuant to statutory authority, required that a plumber (*a*) furnish a guarantee bond in the amount of $3,000 for the faithful observance of the plumbing rules of the board of health, (*b*) obtain a bond permit, and (*c*) register in a book kept by the board of health for that purpose. The court of appeals was of the view that none of these requirements was unreasonable and affirmed the overruling by the lower court of a demurrer to the accusation.

DEATHS DURING WEEK ENDED MAY 10, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 10, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,279	8,607
Average for 3 prior years	8,406	
Total deaths, first 19 weeks of year	174,521	175,321
Deaths per 1,000 population, first 19 weeks of year, annual rate	12.8	12.9
Deaths under 1 year of age	478	524
Average for 3 prior years	523	
Deaths under 1 year of age, first 19 weeks of year	10,098	9,722
Data from industrial insurance companies:		
Policies in force	64,517,124	65,659,862
Number of death claims	12,394	12,097
Death claims per 1,000 policies in force, annual rate	10.0	9.6
Death claims per 1,000 policies, first 19 weeks of year, annual rate	10.5	10.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 17, 1941

Summary

A decrease was recorded in the number of cases of measles reported for the country as a whole, 37,941 as compared with 39,754 for the preceding week, although slight increases were shown for the New England and Middle Atlantic States, principally in Maine, Massachusetts, and Pennsylvania. The incidence declined in all other geographic areas. The Middle Atlantic, East North Central, and South Atlantic areas continue to record the highest incidence rates. A total of 660,958 cases of measles has been reported to date this year (first 20 weeks), as compared with 638,671 for the corresponding period in 1938.

The number of cases of smallpox increased from 37 for the preceding week to 63, of which more than half (34) occurred in the West North Central States, 21 in South Dakota, where no cases were reported last week. Kentucky reported 9 cases, none last week.

Of a total of 24 cases of Rocky Mountain spotted fever, 4 occurred in eastern States (1 each in New York and Maryland and 2 in Virginia) and 20 in the western area (8 in Wyoming and 5 in Montana). To date 108 cases have been reported in 1941 as compared with 65 in 1940 and 100 in 1939 for the corresponding period.

The number of cases of poliomyelitis dropped from 22 to 18, with Arizona (3) and California (2) the only States reporting more than 1 case.

Of the nine communicable diseases included in the following table, the current incidence of only influenza, measles, and whooping cough was above the 5-year (1936–40) median.

One case of endemic typhus fever was reported in New York, 1 case in California, and 22 cases in the southern States.

Two rats taken in Richmond, Contra Costa County, Calif., in April were reported to have been found plague-infected.

The mortality in large cities continues low. The death rate for the current week in 88 major cities in the United States, as reported by the Bureau of the Census, was 11.3 per 1,000 population, as compared with 11.6 for the preceding week and with a 3-year (1938–40) average of 11.7. The cumulative rate for the first 20 weeks is 12.7, as compared with 12.8 in 1940 (all rates on an annual basis).

Telegraphic morbidity reports from State health officers for the week ended May 17, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940	
NEW ENG.												
Maine	0	1	1	----	----	1	141	417	155	0	0	0
New Hampshire	0	0	0	----	----	----	40	7	34	0	0	0
Vermont	0	0	0	----	----	----	45	1	83	0	0	0
Massachusetts	2	6	6	----	----	----	1,053	766	766	0	1	4
Rhode Island	0	0	0	----	----	----	4	162	80	0	0	0
Connecticut	0	3	2	----	----	3	467	35	189	0	0	0
MID. ATL.												
New York [1 3]	16	18	26	[3] 4	[3] 14	[3] 7	4,134	923	2,251	5	6	8
New Jersey	5	8	10	5	5	5	2,499	887	845	0	1	1
Pennsylvania	16	15	22	----	----	----	5,921	498	616	1	11	8
E. NO. CEN.												
Ohio	4	16	12	11	30	24	3,001	29	542	1	0	1
Indiana	4	3	7	9	1	12	1,097	13	36	1	0	1
Illinois	8	15	25	13	2	17	1,704	203	203	0	0	4
Michigan [4]	5	3	12	2	2	----	3,035	802	564	1	0	0
Wisconsin	1	2	2	15	44	48	2,021	1,065	816	3	0	1
W. NO. CEN.												
Minnesota	23	3	2	1	9	1	24	89	266	1	0	0
Iowa	2	4	5	4	----	----	205	284	152	0	2	1
Missouri	2	5	10	1	2	9	590	31	31	1	1	1
North Dakota	1	1	0	----	2	3	41	3	3	0	0	0
South Dakota	0	3	1	----	----	----	17	1	1	0	0	0
Nebraska	0	5	1	----	----	----	21	12	41	0	0	0
Kansas	1	3	5	15	1	3	771	453	79	0	1	1
SO. ATL.												
Delaware	0	0	0	----	----	----	137	4	14	0	0	0
Maryland [1 4]	6	1	4	3	4	3	400	5	318	3	1	1
Dist. of Col	0	2	3	----	----	----	251	3	107	0	0	1
Virginia [1]	9	11	7	52	108	68	1,149	203	413	2	6	5
West Virginia [4]	10	7	5	10	16	24	621	30	74	0	0	2
North Carolina	9	6	11	6	2	3	1,622	107	272	0	1	1
South Carolina	5	5	4	327	179	126	751	31	31	0	0	0
Georgia [2]	2	2	4	23	40	----	550	109	109	0	0	1
Florida [2]	5	3	3	45	2	3	357	83	78	1	0	0
E. SO. CEN.												
Kentucky	3	4	6	----	46	9	1,057	152	152	2	0	9
Tennessee [2]	2	4	4	37	45	45	425	166	113	3	3	2
Alabama [2]	1	3	5	49	53	53	400	100	100	1	1	1
Mississippi [4]	3	6	5	----	----	----	----	----	----	4	4	1
W. SO. CEN.												
Arkansas	3	3	4	8	34	29	371	52	52	0	0	0
Louisiana [2]	2	7	10	4	7	7	52	14	27	0	1	1
Oklahoma [1]	1	8	6	22	28	51	74	15	86	0	1	1
Texas [2]	16	28	34	510	199	211	1,106	1,580	432	2	4	4
MOUNTAIN												
Montana [1]	0	0	0	1	10	21	36	78	62	0	0	0
Idaho [1]	0	1	0	----	----	1	12	19	23	0	0	0
Wyoming [1]	0	0	0	1	----	----	30	28	26	0	0	0
Colorado [1]	7	6	6	14	4	----	641	78	78	0	0	0
New Mexico	1	0	0	----	8	8	212	99	82	0	1	1
Arizona	2	2	0	65	53	47	125	187	46	0	0	0
Utah [4]	1	0	0	12	----	----	63	607	151	0	0	0
Nevada	0	----	----	----	----	----	0	----	----	0	----	----
PACIFIC												
Washington	1	0	0	----	----	----	21	486	414	0	0	0
Oregon	2	4	3	8	15	19	197	503	78	0	0	0
California [2]	13	11	26	72	49	44	450	420	978	1	2	2
Total	194	238	353	1,349	1,014	1,014	37,941	11,840	12,781	33	48	50
20 weeks	5,452	6,650	9,628	587,421	163,176	145,395	660,958	150,987	194,175	972	832	1,502

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 17 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940	
NEW ENG.												
Maine	0	0	0	12	8	21	0	0	0	0	1	1
New Hampshire	0	0	0	1	0	4	0	0	0	0	0	0
Vermont	0	0	0	9	8	8	0	0	0	0	0	0
Massachusetts	0	1	0	214	189	218	0	0	0	11	3	2
Rhode Island	0	0	0	20	7	15	0	0	0	0	1	1
Connecticut	0	0	0	41	107	86	0	0	0	0	0	1
MID. ATL.												
New York [1 2]	0	0	1	488	1,042	774	0	0	0	9	11	8
New Jersey	1	0	0	274	388	229	0	0	0	2	1	3
Pennsylvania	1	2	1	388	389	389	0	0	0	5	16	5
E. NO. CEN.												
Ohio	0	0	0	228	351	274	0	0	0	4	0	5
Indiana	0	0	0	82	85	115	1	4	19	0	3	3
Illinois	1	0	1	298	744	570	6	1	16	4	4	6
Michigan [4]	0	0	0	255	385	385	0	1	4	5	2	4
Wisconsin	0	0	0	127	130	139	2	1	3	0	0	0
W. NO. CEN.												
Minnesota	0	0	0	55	70	127	0	1	8	1	0	0
Iowa	0	1	0	29	41	96	8	5	26	1	0	1
Missouri	0	1	0	160	52	127	3	0	24	0	2	2
North Dakota	0	0	0	2	12	23	0	1	3	0	0	0
South Dakota	1	0	0	14	5	12	21	1	11	0	0	0
Nebraska	0	0	0	8	10	25	1	0	5	0	0	0
Kansas	0	0	0	19	49	98	1	1	6	1	1	1
SO. ATL.												
Delaware	0	0	0	12	4	4	0	0	0	0	0	0
Maryland [1 4]	0	0	0	33	49	43	0	0	0	4	0	2
Dist. of Col.	0	0	0	11	33	14	0	0	0	1	0	0
Virginia [1]	1	0	0	19	31	18	0	0	0	4	2	5
West Virginia [4]	0	1	0	34	38	35	1	0	0	2	6	5
North Carolina	0	1	1	16	22	17	1	0	0	2	0	4
South Carolina	0	0	0	12	2	2	0	0	0	1	1	3
Georgia [2]	0	0	0	16	16	16	4	2	0	6	5	6
Florida [2]	1	0	0	2	6	6	0	0	0	4	2	5
E. SO. CEN.												
Kentucky	0	1	0	115	49	47	9	1	1	6	5	5
Tennessee [2]	0	0	0	43	65	21	0	1	1	5	5	5
Alabama [2]	1	0	0	13	7	5	0	10	0	1	7	6
Mississippi [4]	1	3	0	0	7	5	0	2	1	0	2	2
W. SO. CEN.												
Arkansas	1	0	0	3	6	6	1	1	1	1	2	2
Louisiana [2]	1	0	1	3	6	7	0	0	0	6	7	7
Oklahoma [1]	1	0	0	14	6	16	0	0	4	3	2	5
Texas [2]	1	0	1	34	33	46	0	5	7	7	5	9
MOUNTAIN												
Montana [1]	0	0	0	15	19	17	0	0	5	0	1	1
Idaho [1]	0	0	0	1	10	10	0	0	3	0	1	1
Wyoming [1]	0	0	0	9	5	5	0	0	0	0	0	0
Colorado [1]	0	1	0	23	38	38	2	16	3	1	3	1
New Mexico	0	0	0	0	2	7	0	0	0	3	1	0
Arizona	3	0	0	3	9	10	0	0	0	1	1	2
Utah [4]	0	2	0	9	20	20	0	0	0	0	1	1
Nevada	0	----	----	0	----	----	0	----	----	0	----	----
PACIFIC												
Washington	1	7	0	24	46	46	1	0	5	0	0	0
Oregon	0	1	0	7	8	22	1	1	8	0	1	2
California [2]	2	4	3	105	134	166	0	6	12	1	5	5
Total	18	26	21	3,300	4,743	4,743	63	61	237	102	110	150
20 weeks	464	467	404	73,548	96,417	113,890	921	1,441	6,239	1,583	1,670	2,265

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 17, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough	
	Week ended—	
	May 17, 1941	May 18, 1940
NEW ENG.		
Maine	36	22
New Hampshire	13	14
Vermont	28	27
Massachusetts	257	176
Rhode Island	29	9
Connecticut	93	33
MID. ATL.		
New York [1] [3]	257	322
New Jersey	134	112
Pennsylvania	392	276
E. NO. CEN.		
Ohio	452	203
Indiana	35	35
Illinois	108	110
Michigan [4]	389	215
Wisconsin	125	135
W. NO. CEN.		
Minnesota	101	51
Iowa	50	30
Missouri	78	19
North Dakota	29	2
South Dakota	19	1
Nebraska	18	8
Kansas	169	30
SO. ATL.		
Delaware	5	6
Maryland [1] [4]	77	127
District of Columbia	23	5
Virginia [1]	140	57
West Virginia [4]	46	50
North Carolina	276	112
SO. ATL.—continued		
South Carolina	163	21
Georgia [2]	58	28
Florida [2]	21	11
E. SO. CEN.		
Kentucky	67	115
Tennessee [2]	99	45
Alabama [2]	51	16
Mississippi [4]	----	----
W. SO. CEN.		
Arkansas	50	11
Louisiana [2]	14	24
Oklahoma [1]	26	26
Texas [2]	300	366
MOUNTAIN		
Montana [1]	24	2
Idaho [1]	22	23
Wyoming [1]	6	3
Colorado [1]	249	13
New Mexico	27	48
Arizona	43	23
Utah [4]	100	217
Nevada	1	----
PACIFIC		
Washington	177	43
Oregon	42	8
California [2]	774	501
Total	5,693	3,731
20 weeks	91,181	62,687

[1] Rocky Mountain spotted fever, week ended May 17, 1941, 24 cases, as follows: New York, 1; Maryland 1; Virginia, 2; Oklahoma, 1; Montana, 5; Idaho, 2; Wyoming, 8; Colorado, 4.

[2] Typhus fever, week ended May 17, 1941, 24 cases, as follows: New York, 1; Georgia, 7; Florida, 3; Tennessee, 1; Alabama, 3; Louisiana, 1; Texas, 7; California, 1.

[3] New York City only.

[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 3, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	116	125	49	5,124	577	1,994	19	386	23	1,235	------
Current week [1]	54	76	20	11,876	318	1,430	0	387	14	1,495	------
Maine:											
Portland	0	------	0	1	2	0	0	0	0	6	16
New Hampshire:											
Concord	0	------	0	4	0	0	0	0	0	0	8
Manchester	0	------	0	0	0	0	0	0	0	0	6
Nashua	0	------	0	0	0	0	0	0	0	5	7
Vermont:											
Barre	0	------	0	0	1	0	0	0	0	0	4
Burlington	0	------	0	7	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	2
Massachusetts:											
Boston	0	------	1	302	7	94	0	10	1	34	221
Fall River	1	------	0	2	1	4	0	0	0	7	31
Springfield	0	------	0	27	0	9	0	0	0	13	35
Worcester	0	------	0	31	4	7	0	3	1	8	47
Rhode Island:											
Pawtucket	0	------	0	0	0	3	0	0	0	1	14
Providence	2	2	0	2	3	3	0	3	0	17	57
Connecticut:											
Bridgeport	0	------	0	21	0	7	0	0	0	0	26
Hartford	1	------	0	3	2	4	0	2	0	2	29
New Haven	0	1	0	7	0	18	0	0	0	13	21
New York:											
Buffalo	0	------	1	74	6	47	0	7	0	16	127
New York	17	5	1	3,377	66	278	0	87	1	74	1,459
Rochester	0	------	0	228	2	1	0	0	0	13	53
Syracuse	0	------	0	0	2	3	0	0	0	12	43
New Jersey:											
Camden	0	------	0	18	3	20	0	0	0	2	28
Newark	0	3	0	141	0	47	0	9	0	18	93
Trenton	0	1	0	42	1	32	0	5	0	3	32
Pennsylvania:											
Philadelphia	1	1	0	707	16	119	0	41	0	59	486
Pittsburgh	4	2	3	1,001	6	17	0	11	1	49	166
Reading	0	------	0	85	0	5	0	1	0	2	24
Scranton	0	------	------	31	------	0	0	------	0	6	------
Ohio:											
Cincinnati	1	1	0	163	1	69	0	6	0	5	122
Cleveland	0	4	0	173	15	40	0	11	0	86	187
Columbus	0	1	1	198	3	12	0	1	0	60	75
Toledo	0	------	0	393	3	2	0	1	0	19	70
Indiana:											
Anderson	1	------	0	------	0	0	0	0	0	0	7
Fort Wayne	0	------	0	25	1	1	0	0	0	3	32
Indianapolis	1	------	0	540	3	21	0	2	0	29	101
Muncie	0	------	0	42	2	3	0	0	0	1	16
South Bend	0	------	0	33	2	2	0	0	0	0	17
Terre Haute	0	------	0	3	0	0	0	0	0	0	13
Illinois:											
Alton	0	------	0	2	0	3	0	0	0	0	10
Chicago	5	2	2	518	22	157	0	34	0	34	704
Elgin	1	------	0	37	0	1	0	0	0	0	5
Moline	0	------	0	31	0	2	0	0	0	1	10
Springfield	0	------	0	11	3	3	0	0	0	0	14
Michigan:											
Detroit	0	2	0	728	9	101	0	13	0	186	261
Flint	0	------	0	137	2	3	0	0	0	10	25
Grand Rapids	0	------	0	319	3	9	0	1	0	1	36
Wisconsin:											
Kenosha	0	------	0	143	0	1	0	0	0	0	8
Madison	0	------	0	28	0	4	0	0	0	1	------
Milwaukee	------	------	------	------	------	------	------	------	------	------	------
Racine	0	------	0	34	0	4	0	0	1	3	8
Superior	0	------	0	0	0	0	0	0	0	10	12
Minnesota:											
Duluth	0	------	0	0	1	0	0	0	0	19	28
Minneapolis	2	------	0	13	3	15	0	2	0	24	85
St. Paul	0	------	0	3	1	6	0	3	0	30	73

[1] Figures for Milwaukee and Fargo estimated; reports not received.

City reports for week ended May 3, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	----	----	6	----	0	0	----	0	0	----
Davenport	0	----	----	10	----	1	0	----	0	0	----
Des Moines	0	----	----	14	----	4	0	----	0	2	35
Sioux City	0	----	----	7	----	0	0	----	0	17	----
Waterloo	0	----	----	47	----	1	0	----	0	4	----
Missouri:											
Kansas City	0	----	0	104	5	12	0	1	0	6	95
St. Joseph	1	----	0	13	2	1	0	0	0	0	24
St. Louis	0	1	1	279	11	89	0	4	2	42	207
North Dakota:											
Fargo	----	----	----	----	----	----	----	----	----	----	----
Grand Forks	0	----	----	1	----	0	0	----	0	0	----
Minot	0	----	----	10	----	0	0	----	0	2	3
South Dakota:											
Aberdeen	0	----	----	0	----	0	0	----	0	1	----
Sioux Falls	0	----	----	0	----	6	0	----	0	0	----
Nebraska:											
Lincoln	0	----	----	2	----	2	0	----	0	0	----
Omaha	0	----	0	7	0	7	0	1	0	0	45
Kansas:											
Lawrence	0	----	0	12	0	0	0	0	0	4	2
Topeka	0	----	0	138	1	0	0	0	0	8	17
Wichita	2	1	0	4	1	4	0	0	0	16	24
Delaware:											
Wilmington	0	----	0	27	1	8	0	1	0	0	24
Maryland:											
Baltimore	0	1	0	162	14	16	0	15	0	59	221
Cumberland	0	----	0	3	0	1	0	0	0	2	13
Frederick	0	----	0	2	0	1	0	0	0	2	4
Dist. of Col.:											
Washington	0	----	0	299	1	13	0	17	2	24	165
Virginia:											
Lynchburg	0	----	0	0	0	0	0	0	0	3	6
Norfolk	0	----	0	209	1	1	0	0	0	1	29
Richmond	0	----	0	88	2	1	0	1	0	0	50
Roanoke	0	----	0	22	1	0	0	0	0	8	19
West Virginia:											
Charleston	0	----	0	3	0	1	0	0	0	0	7
Huntington	0	----	----	133	----	2	0	----	0	2	----
Wheeling	0	----	0	72	2	0	0	1	0	3	19
North Carolina:											
Gastonia	0	----	----	24	----	0	0	----	0	6	----
Raleigh	0	----	0	17	0	0	0	1	0	8	10
Wilmington	0	----	0	9	1	0	0	1	0	17	12
Winston-Salem	0	----	0	12	0	0	0	0	0	7	15
South Carolina:											
Charleston	0	4	1	13	3	0	0	0	2	0	23
Florence	0	----	0	0	0	0	0	0	0	3	5
Greenville	0	----	0	17	3	1	0	0	0	4	18
Georgia:											
Atlanta	0	2	0	18	3	1	0	4	0	0	79
Brunswick	0	----	0	18	3	0	0	0	0	0	4
Savannah	0	1	0	19	2	9	0	3	0	1	29
Florida:											
Miami	0	3	----	14	----	0	0	----	1	10	----
St. Petersburg	0	----	0	21	0	0	0	0	0	0	17
Tampa	0	1	1	0	0	1	0	0	0	0	30
Kentucky:											
Ashland	0	----	0	6	1	0	0	2	0	0	9
Covington	0	----	0	4	0	4	0	----	0	0	16
Lexington	0	----	0	4	0	2	0	1	0	4	16
Tennessee:											
Knoxville	0	----	0	61	0	3	0	0	0	2	24
Memphis	0	----	3	123	2	2	0	6	0	14	90
Nashville	0	----	1	102	6	3	0	0	0	5	41
Alabama:											
Birmingham	0	1	0	37	5	5	0	6	0	0	64
Mobile	1	2	0	1	4	0	0	0	0	0	23
Montgomery	0	----	----	30	----	0	0	----	0	2	----
Arkansas:											
Fort Smith	0	----	----	10	----	2	0	----	0	0	----
Little Rock	0	7	0	22	5	1	0	3	0	3	37
Louisiana:											
Lake Charles	0	----	0	3	0	0	0	0	0	0	2
New Orleans	2	----	1	10	6	2	0	13	0	3	135
Shreveport	0	----	0	2	5	2	0	3	0	0	60

City reports for week ended May 3, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	2	1	16	2	3	0	0	0	0	40
Tulsa	0	----	0	33	1	0	0	1	0	4	25
Texas:											
Dallas	2	2	0	65	1	9	0	1	0	12	58
Fort Worth	0	----	1	14	4	0	0	0	0	7	36
Galveston	0	----	0	3	2	1	0	0	0	0	13
Houston	0	----	0	3	7	0	0	4	0	0	67
San Antonio	0	2	1	1	2	0	0	12	0	2	68
Montana:											
Billings	0	----	0	0	1	2	0	0	0	0	4
Great Falls	0	----	0	0	1	2	0	0	0	0	10
Helena	0	----	0	0	0	0	0	0	0	0	----
Missoula	0	----	0	0	0	1	0	0	0	0	3
Idaho:											
Boise	0	----	0	23	0	0	0	0	0	0	5
Colorado:											
Colorado Springs	0	----	0	7	0	3	0	1	0	3	16
Denver	7	5	1	445	6	5	0	4	1	150	87
Pueblo	0	----	0	8	1	2	0	0	0	35	17
Arizona:											
Phoenix	0	26	----	3	----	0	0	----	0	1	----
Utah:											
Salt Lake City	1	----	0	6	2	4	0	2	0	16	45
Washington:											
Seattle	1	----	0	2	1	1	0	1	0	40	84
Spokane	0	----	0	9	0	3	0	0	0	3	27
Tacoma	0	----	0	0	2	0	0	0	0	6	26
Oregon:											
Portland	2	2	1	8	2	5	0	2	0	1	92
Salem	0	1	----	1	----	0	0	----	0	0	----
California:											
Los Angeles	1	15	0	54	3	28	0	13	0	44	377
Sacramento	1	3	0	4	2	1	0	4	2	20	28
San Francisco	0	2	0	7	5	9	0	10	0	41	177

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Worcester	1	0	0	Baltimore	3	0	0
Connecticut:				West Virginia:			
Bridgeport	1	0	0	Huntington	1	1	0
New York:				Florida:			
Buffalo	0	1	0	Miami	0	0	1
New York	4	3	0	California:			
Pennsylvania:				Los Angeles	0	0	2
Pittsburgh	1	0	1				
Illinois:							
Chicago	1	1	0				

Encephalitis, epidemic or lethargic.—Cases: Philadelphia, 2; Pittsburgh, 1; Aberdeen, 1; Norfolk, 1. Deaths: New York, 1; Norfolk, 1.
Pellagra.—Cases: Boston, 1; St. Louis, 1; Savannah, 2.
Rabies in man.—Deaths: Pittsburgh, 1.
Typhus fever.—Cases: St. Petersburg, 1; Tampa, 1; New Orleans, 1; San Antonio, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on April 10, 1941, at Paauhau in the Paauhau area of Hamakua District, Island of Hawaii, has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 12, 1941.—During the week ended April 12, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	9	11	10	5	18	1	1	8	5	68
Chickenpox		13	2	132	174	26	44	27	50	468
Diphtheria		10	2	10	41	1		9		73
Dysentery				1						1
Influenza		38			6				27	71
Measles		158	10	290	1,181	56	157	116	781	2,749
Mumps		5		330	253	25	26	14	43	696
Pneumonia		23			6		2		3	34
Poliomyelitis				1						1
Scarlet fever		32	12	84	211	5	4	1	21	370
Tuberculosis		3	14	59	30	1	17			124
Typhoid and paratyphoid fever		1	3	10	1					15
Whooping cough		1		93	94	1	5	8	15	217

CUBA

Habana—Communicable diseases—4 weeks ended April 5, 1941.—During the 4 weeks ended April 5, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	22		Tuberculosis		2
Scarlet fever	3		Typhoid fever	18	2

Provinces—Notifiable diseases—4 weeks ended March 29, 1941.—During the 4 weeks ended March 29, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		5	8	1	5	20
Chickenpox		3	2		1		6
Diphtheria		11	1	1		4	17
Hookworm disease		8					8
Leprosy				2		1	3
Malaria	30	1		19	1	129	180
Measles	1	4	14	1	93		113
Rabies			1				1
Scarlet fever		3		1			4
Tuberculosis	19	44	30	40	4	61	198
Typhoid fever	21	50	10	10	15	48	154
Whooping cough		8				7	15

SWEDEN

Notifiable diseases—February 1941.—During the month of February 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	5	Poliomyelitis	8
Diphtheria	23	Scarlet fever	906
Dysentery	1	Syphilis	18
Gonorrhea	623	Typhoid fever	4
Paratyphoid fever	7	Undulant fever	11

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of April 25, 1941, pages 924-928. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Macao.—During the week ended May 3, 1941, 10 cases of cholera were reported in Macao, China.

India—Chittagong.—During the week ended May 10, 1941, cholera was reported present in Chittagong, India.

Plague

China—Foochow.—A report dated May 6, 1941, stated that several cases of human and rodent plague had been reported in Foochow, China.

Typhus Fever

Spain.—Typhus fever has been reported in Spain as follows: Week ended April 5, 1941, 343 cases, including 234 cases in Madrid, 33 in Seville, and 18 in Malaga. Week ended April 12, 1941, 234 cases, including 163 in Madrid, 13 in Seville, and 16 in Malaga. For the period January 26 to April 12, 1941, 968 cases of typhus fever with 131 deaths were reported.

Yellow Fever

Gold Coast—Accra.—On April 2, 1941, 1 case of yellow fever with 1 death was reported in Accra, Gold Coast.

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